THE POLITICS OF PARTICULARISM: HBCUs, SPELMAN COLLEGE, AND THE STRUGGLE TO EDUCATE BLACK WOMEN IN SCIENCE, 1950-1997

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Education is not a neutral process. Whenever decisions are made about what is taught and how it is taught, a political statement is made.

Johnetta Cross Brazzell,

Bricks Without Straw, 1992

ACKNOWLEDGMENTS

This dissertation has been more than 15 years in the making, from the day in late spring of 1991 when I first met Etta Falconer, a key actor in this narrative, to her death from cancer in the fall of 2002. In the years that I worked with Dr. Falconer (I never referred to her as anything other, despite a personal relationship that extended beyond the college campus), I knew the Spelman story was exceptional and frequently prodded science faculty to "claim" their achievements and document their efforts. Thank goodness Beverly Guy-Sheftall, founding director of the Women's Research and Resource Center at Spelman College, was able to convince a begrudging Falconer to put pen to paper in 1989 in preparation for a special issue of *SAGE: A Scholarly Journal on Black Women* that would be devoted to the roles and contributions of African American women in science and technology. Similar to many educators of Falconer's generation and to educators at HBCUs more broadly, she claimed never to have the time to write these stories; too busy, I suppose, tending to the business of educating Black youth.

That brief, but important three-page article in *SAGE* was the only piece Falconer ever published about the growth of the Spelman science program, and my personal interview of her in 1999 was one of a few that she ever granted. The racism that Falconer experienced as a Ph.D.-trained Black, female mathematician in navigating the U.S. scientific enterprise to support the students of Spelman translated into skepticism about

what researchers ultimately did with the data and charges that appropriate credit was never accorded to Spelman College as an educational entrepreneur in undergraduate science education reform efforts.

Falconer never asked me to write the history of Spelman but was incredibly supportive when she learned of my efforts, as were others – beginning with my own family. I am the youngest of two children born to parents with southern roots who believed in education but never graduated high school. In the boom of the post-WWII economy, the opportunity to travel north to make money took precedence, though both would earn the general equivalency diploma late in life. Neither Harold nor Delores would live to see me complete this rite of passage, dying from diseases which continue to burden the African American community. The strength of my mother's image (lugging a shopping cart on a New York City subway which she had loaded with a set of encyclopedias given to her by a Jewish employer whose apartment she cleaned several days a week) carried me through undergrad at New York University. A black-and-white photo of my mother, smiling carefree with three lifelong girlfriends, sits atop a piano in my dining room-turned-dissertation war room. That photo and childhood memories kept me sane and focused through requests by my dissertation co-chairs to analyze the data more critically and to take another pass on a chapter which I stubbornly believed to be good enough.

I had the fortune of having two dissertation co-chairs who oversaw my work, Steve Usselman, an historian, and Willie Pearson, Jr., a sociologist. Steve's reputation amongst the graduate students is infamous – hard-nosed and critical. But that didn't stop many from asking Steve to be on their committees. We all knew that behind the prodding was a commitment to the graduate school process and to our growth as scholars capable of critical analysis. It was Steve who, unbeknownst to me, recommended me for the Georgia Tech President's Fellowship (which I was awarded) and took a keen interest in my research topic, though it was well outside of his primary specialty as an historian of technology.

One would have thought Tech had recruited a movie star when I learned Willie Pearson, Jr. was being considered to chair the HTS program. For more than two decades, Willie has documented the role of HBCUs in educating African American scientists, the contributions of U.S.-born Blacks to science, and the disconnect between federal policy and support for institutions that are demonstrably successful – HBCUs. Willie's body of work informs my own, and his encouragement, support, and guidance to tell the story in direct and unapologetic terms was tremendously humbling and inspiring.

My other committee members were also supportive, even if they rarely saw me but accommodated my preference for e-mail. Sue Rosser's questions about the place of Spelman within larger studies on productive science programs at other women's institutions nationally have sparked ideas that I hope to address through later projects. And while Eleanor Alexander and Ron Bayor are not historians of science, the two offered perspectives that speak generally to the need to facilitate greater dialogue between those who study science and technology with scholars in other areas.

My external committee member, Evelynn Hammonds, became a source of inspiration when I first read the seminal interview Aimee Sands conducted with her in 1993. Thirteen years after earning the doctoral degree in the history of science from Harvard University, Evelynn is still one of only a handful of African Americans and African American women studying in the field. We both find the numbers curious and unacceptable. Evelynn's commitment to increasing our interest and presence is evidenced by her own example, agreeing to serve on my committee despite an extraordinary load as senior vice provost at Harvard.

Early in this process, I was awarded a President's Fellowship from Georgia Tech, generous funding which off-set the cost of tuition and books. A later fellowship in 1996 from the American Association of University Women (AAUW) Educational Foundation, under that organization's Career Development Grants Program, enabled me to travel to conduct research at Bryn Mawr and present the initial findings of my work at AAUW's annual symposium in 1999. The Bryn Mawr community was especially welcoming, including Nancy J. Vickers, president; Rhonda J. Hughes and Danielle Carr, faculty in mathematics; Nona C. Smith, director of sponsored research; Jan Trembley, editor of the *Byrn Mawr Alumnae Bulletin*, and all of the extremely helpful staff in the archives and at the Wyndham Guest House. I thank both Tech and AAUW for providing me with the funding to continue my studies, explore the resources of Bryn Mawr, and network with other women who were engaged in similar efforts to obtain the doctoral degree.

The small community of faculty-scholars, graduate students, and staff in the History, Technology and Society (HTS) program at Georgia Tech were also instrumental. Bruce Sinclair, who chaired the HTS program in 1996, went out of his way to recruit me to the program and sent special congratulations when he learned I passed my oral defense. The ever-affable Gus Giebelhaus sat in on my defense, even though he didn't have an advance copy of my manuscript. When I drifted into one of the "unseen" after finishing my course work and qualifying exams, Gus and other HTS faculty with whom I had worked and studied, Greg Noble and Doug Flamming amongst them, always seemed genuinely happy to see me and inquired earnestly about my progress. The significance of small gestures such as those are difficult to appreciate in the moment, but are the source of nice memories during moments of reflection.

As a nontraditional student, my experience at Tech would have been characterized solely by classes, research, and writing had it not been for the support and fellowship of my other grad colleagues -- Haven Hawley, Ben Shackelford, Tim Stoneman, Kamau Bobb, and Kathy Brice. I was pleasantly surprised to see Steven Henderson, a staff member, come to one of my presentations and express interest in the topic. Denise Corum has been one of the few mainstays who has known me from the beginning. And when I began to get frazzled at the end from the bureaucracy that is Tech, LaDonna Bowen patiently helped me navigate through the endless forms and unforgiving deadlines.

In and outside of Spelman, I must thank all those who would kindly ask, "How's it going?"and rejoiced loudly at the news that I had finally finished – Sylvia Bozeman, Audrey Manley, Connie Gillyard, Peter Chen, Jean-Marie Dimandja, Barbara Bell, Al

Thompson, Danny Flanigan, Cynthia Spence, Andrea Barnwell, Ayoka Chenzira, Anne Bailey, Eloise Alexis, Anna Scott, Shelia McClure, Fatemeh Shafiei, Johnnetta Cole, Freddye Hill, Angela Getter, Jesse Lutabingwa, Mary Patterson McPherson, Danielle Carr Ramdath, and numerous others whose names I may have overlooked but whose kind words and well wishes I sincerely appreciate. In particular, Taronda Spencer, the Spelman archivist, was invaluable, opening up the facility on weekends or keeping it open well after hours if she happened to be on campus and if I needed the extra time -- which I always did! My dear friend Beverly Guy-Sheftall always made the time to act as a sounding board or scour through her own home library to find articles and books. As a Black feminist scholar, Spelman alumna, 35-year-member of the institution's faculty, and one who has written on the history of the college, Beverly held no reservations in questioning certain myths that revolve among alumnae around Spelman's history, as well as biases that exist among scholars and which render Spelman nearly invisible within the history of women's education. I look forward to future narratives that Beverly promises to write.

I save my last acknowledgment for one whose love and patience I value most, my daughter, Imani Folasade Rashiyd-Williams. When I began this process in 1996, Imani was finishing her last year of elementary school. She is now an exceptionally talented and socially conscious young woman studying nursing at Florida A&M University. Through no fault of her own, Imani never quite understood what I was doing, never complained too loudly or often about what must have seemed like an inordinate time commitment, but gleefully trumpeted her support as I neared the end. In the vernacular

of the hip hop generation, her exact words were, “well, alright now!” Through the promise that I see in her eyes, I truly understand the redemption of sacrifice that has characterized the African American experience and continues to offer faith and hope.

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SUMMARY

Since the close of World War II, higher education has been central to the growth of U.S. science, but the role of historically Black colleges and universities (HBCUs) has been under-explored within this narrative. The nation's 105 HBCUs constitute less than one percent of the U.S. higher education community, but consistently have served as a major conduit for the production of African Americans in the sciences, technology, mathematics and engineering (STEM). National Science Foundation data reflect an average 29 percent share for the period 1994-2001. The output is even more striking when examined by degrees awarded in disciplinary clusters – 50 percent in the agricultural sciences, 45 percent in the physical sciences and mathematics, and 42 percent in the biological sciences.

This research explores the role of HBCUs in educating African Americans in science from the boosterism period shortly following World War II, through affirmative action legislation of the 1960s and 1970s, and concluding with current federal policies. Once simply normal schools for four million formerly enslaved African Americans who could neither read nor write, and then transformed into training grounds for laborers and other blue-collar occupations, HBCUs have battled against structural limitations that left them outside the initial national effort that made the university central to the growth of the U.S. scientific enterprise. HBCUs were under-funded, poorly equipped, and designed to

prepare the country's Black population as a servant class. The nation felt non-threatened in channeling newly-freed Blacks into vocational and low-level industrial training. But simple trades would hold little social capital in the new society that was taking form at the end of the nineteenth-century. In the new economy and culture of large-scale private enterprise, specialized fields in science and engineering would be the careers of promise. HBCUs were both politically and economically marginalized.

This study focuses particular attention on Spelman College, an historically Black, private liberal arts college established in Atlanta, Georgia in 1881 by two white, New England missionaries as a seminary for former slave women and girls. Spelman presents a unique case to analyze the particularistic characteristics of race, gender and institutional setting within the context of a so-called normative structure of science. The curriculum at the few Black women's colleges in the South that managed to remain in existence by the mid-1950s were centered around large vocational and professional departments to train Black female teachers, nurses, and social service workers to aid in the uplift of the race. The thought of Black women as scientists, mathematicians and engineers was outside the frame of reference – and acceptance – of what society thought Black women could or should be.

The civil rights activism of the 1960s and feminist mobilization of the 1970s disrupted public images about who got to participate in science and the nature of that participation. Those decades would also set the stage for changes to the federal policy agenda and the higher education landscape. As a Black college and a woman's institution, Spelman was in the right place at the right time to begin to re-invent and expand its science program. It was a 25-year effort, begun in the early 1970s by two African-American female mathematics faculty at the institution. Raised in segregated communities in the South, the two women wanted to facilitate a culture that believed Black women could be female and scientists and create an environment that nurtured their growth.

This process of convergence, however, lagged nearly a century behind similar efforts at the older, white women’s colleges in the northeast. While those institutions also struggled against the limitations imposed by the notion of a women’s sphere, there were major differences. Those differences included the freedom afforded by growing endowments. Financial resources enabled those institutions to create curricula that provided students the opportunity to excel in the sciences and faculty the opportunity to establish programs that provided an entering wedge for white women in the profession.

Such advantages notwithstanding, Spelman was able to rise beyond the structural limitations of its position as a Black college, a women's college, and a southern college to become one of the single most productive undergraduate institutions for African American women earning the baccalaureate degree in science. What new perspectives might the Spelman story specifically and the history of HBCUs generally offer about the history of U.S. science, the notion that careers be open to talent, and current public policy discourse regarding efforts to increase the participation of under-represented racial minorities and women in science, engineering and mathematics?

This research draws on and reacts to a growing body of literature has argued that the science community does not exist separate from the rest of society but knows a very definite politics that is tempered by belief systems that facilitate, both explicitly and implicitly, gender- and racially-based stratification. Scholars, educators and advocates for policy and educational reform have particularly trumpeted the case for women.

In the early 1980s and up through the 1990s, the Women's College Coalition released a series of studies which highlighted the unique and particular role women's institutions have and continue to play in producing women scientists. The assumption in the early work, however, was that women's institutions were productive for *all* women. Later work by Lisa Wolf-Wendel dis-aggregated institution productivity based on race and gender. This refined methodology enabled an entirely different group of institutions to emerge – historically Black colleges and Hispanic-serving institutions – and complemented earlier findings by Cheryl Leggon and Pearson, Jr., as well as the seminal study by James M. Jay in 1971. With the focus moving away from individual achievements to institutional productivity, further refinements in research methods would be captured with the use of qualitative case studies to explore institutional priorities, patterns and principles that have been developed and applied at women's colleges that might inform other efforts to improve women's educational experiences.

Utilizing a sociohistorical approach, the present study is nestled within that genre and complements those efforts. My thesis is that it is the politics of particularlism, not an ideal of universalism, that has fundamentally determined who participates in science and has had a significant impact on HBCUs. Despite these constraints, the contributions that Spelman and other productive HBCUs have made to the U.S. scientific workforce have been enormous. Their legacies and documented patterns of student development and degree productivity speak to a shift in how the nation defines, classifies and ranks “top” universities and how policy officials make decisions and allocate resources. The educational strategies developed at these institutions provide model practices for the U.S. higher education system which continues to struggle with attracting, retaining and successfully graduating students who emerge as the next generation of scientists, mathematicians, and engineers.

CHAPTER 1

INTRODUCTION

> What happens when historians leave out many of America's people? When someone with the authority of a teacher describes our society, and you are not in it? Such an experience can be disorienting – a moment of psychic disequilibrium, as if you looked into the mirror and saw nothing.
>
> Ronald Takaki, *A Different Mirror: A History of Multicultural America,* 1993

Since the close of World War II, higher education has been central to the growth of U.S. science, but the role of historically Black colleges and universities has been under-explored within this narrative. A few early studies documented that African American scientists did exist, recovered names that had long been overlooked in the literature, and documented a tradition of intellectual achievement and technological innovation.[1]

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[1] Two of these earlier studies were James M. Jay, *Negroes in Science: Natural Science Doctorates, 1876-1969.* Detroit: Belamp, 1971 and Julius H. Taylor (ed.), *The Negro in Science*, Baltimore: Morgan State College Press, 1955. The Jay study traced the geographic, undergraduate and graduate origins of 587 African Americans who had obtained doctorates in the natural sciences through 1969. The tables in the volume are illuminating, and the author devotes special attention to African American female degree

(continued...)

Described as statistical rarities, these men and women were, by and large, the products of or faculty at historically Black colleges and universities. This early scholarship traced degree origins but did little to connect HBCUs to a larger analysis of the philosophies underpinning the practice of U.S. science.

Later work, such as Kenneth Manning's (1983)[2] biography of Dartmouth-trained biologist Ernest Everett Just and Pearson and Bechtel's (1989)[3] study of the role of American education in training Black scientists, represented a significant increase in the scope and depth of critical analysis. These works helped to contextualize the experiences of African American scientists and to say more about the politically and economically marginalized Black college. In 1992, *Science* released a special series devoted to the status of racial minorities in science and engineering disciplines and intervention

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[1](...continued)
attainment. The Taylor volume was published in conjunction with the dedication of the science quadrangle at Morgan State College, an HBCU. The volume is segmented by disciplinary cluster, and each chapter is introduced with a survey of African Americans in the field. Both the Jay and Taylor volumes are significant in that they documented the numbers of African American scientists and gave some sense that they were active in their fields, using publication as a measure of productivity. And while the introduction to the Taylor volume by then chair of physics at Howard University, Herman Branson, provides a brief account of the factors responsible for the rarity of the African American male scientist (no publications of women are included), neither volume involves a sustained analysis or attempt to connect the data and publications to the history of U.S. science.

[2] Kenneth R. Manning, *Black Apollo of Science: The Life of Ernest Everett Just.* Oxford University Press, 1983.

[3] Willie Pearson, Jr. and H. Kenneth Bechtel (eds.), *Blacks, Science and American Education*. New Brunswick: Rutgers University Press, 1989.

programs at Black colleges designed to increase under-representation.[4] The volume was a refreshing change from the founder of that journal's mis-guided generalization that "there is not a single mulatto [Black person] who has done creditable scientific work."[5] However, when compared against the larger corpus of scholarship in the history of U.S. science, these contributions have been far between and few. Consequently, HBCUs have been rendered peripheral, if not inconsequential, to the growth of U.S. science.

This proposition simply is not true. Manning (1998) argues that the scientific community owes a great debt to HBCU faculty for mentoring Black students who would later earn their doctorates at white institutions in the late 1950s and 1960s and contribute, in varied capacities, to the U.S. scientific enterprise.[6] Diann Jordan (2006) reaches a similar conclusion, noting that "if it were not for HBCUs, most of the early strides in increasing the number of African Americans receiving degrees in science and engineering would simply not have happened."[7]

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[4] See *Science*, New Series, 258, No. 5085 (Nov. 13, 1992): 1057-1276

[5] J. McKeen Cattell, "Science, Education and Democracy," in *Science* vol.39, no. 996 (Jan. 30, 1914):154-164

[6] Kenneth R. Manning, "Science and Opportunity," in *Science* vol.282, no.5391 (Nov. 6, 1998): 1037-1038.

[7] Diann Jordan. *Sisters in Science: Conversations with Black Women Scientists on Race, Gender, and Their Passion for Science.* Indiana: Purdue University Press, 2006, p. 8

Defining the Argument: Race, Gender and Institutional Context

This study explores the role of HBCUs in educating African Americans in science from the boosterism period shortly following World War II, through affirmative action legislation of the 1960s and 1970s, and concluding with current federal policies. A particular analysis is undertaken of Spelman College, a private liberal arts college founded by New England missionaries in the South during the late nineteenth-century as a seminary for former slave women and girls. Spelman presents a unique case to analyze the particularistic characteristics of race, gender and institutional setting within the context of a so-called normative structure of science. Over a 25-year period, beginning in the early 1970s, Spelman was able to rise beyond the structural limitations of its position as a Black college, a women's college, and a southern college to become one of the single most productive undergraduate institutions for African American women earning the baccalaureate degree in science.[8]

How does the Spelman narrative fit within the larger story of the role HBCUs have played in producing African American scientists, mathematicians, and engineers – in spite of economic and political marginalization? What new perspectives might the

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[8] National Science Foundation, Division of Science Resource Statistics, special tabulations of U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System, Completions Survey, 1997-2001 as referenced in National Science Foundation, Division of Science Resources Statistics, *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2004,* NSF 04-317 (Arlington, VA, 2004). Also see data compiled from the NSF Web CASPAR as cited in American Association for the Advancement of Science, *Standing Our Ground*. Washington, D.C.: AAAS, 2004.

Spelman story specifically and the history of HBCUs generally offer about the history of U.S. science, the notion that careers be open to talent, and current public policy discourse regarding efforts to increase the participation of under-represented racial minorities and women in science, engineering and mathematics?

As I explore more fully in Chapter 2, a growing body of literature has argued that the science community does not exist separate from the rest of society but knows a very definite politics that is tempered by belief systems that facilitate, both explicitly and implicitly, gender- and racially-based stratification.[9]

Scholars, educators and advocates for policy and educational reform have particularly trumpeted the case for women. The body of work by M. Elizabeth Tidball,[10] and later studies by the Women's College Coalition,[11] highlight the unique and particular role

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[9] See, for example, Daniel Lee Kleinman. *Politics on the Endless Frontier.* Durham and London: Duke University Press, 1995.

[10] See M. Elizabeth Tidball, "Women's Colleges vs. Coeducation: A Question of Creative Involvement?"*Mount Holyoke Alumnae Quarterly* 54 (1970): 176-78; "Baccalaureate Origins of Recent Natural Science Doctorates," *Journal of Higher Education* 57, No. 6 (Nov. - Dec. 1986): 606-20; Tidball and Daryl G. Smith, Charles S. Tidball and Lisa E. Wolf-Wendel. "*Taking Women Seriously: Lessons and Legacies for Educating the Majority*. Phoenix, Arizona: The American Council on Education and The Oryx Press, 1999; and M. Elizabeth Tidball and Vera Kistiakowsky, "Baccalaureate Origins of American Scientists and Scholars," *Science* 193, No. 4254. (Aug. 20, 1976): 646-652.

[11] See Women's College Coalition. *A Study of the Learning Environments at Women's College.* Washington, D.C., 1981; Women's College Coalition. *A Profile of*

(continued...)

women's institutions have and continue to play in producing women scientists, at rates disproportionate to their numbers and far in excess of larger research universities.

The assumption in the early work, however, was that women's institutions were productive for *all* women. Lisa Wolf-Wendel (1988) dis-aggregated institution productivity based on race and gender.[12] This refined methodology enabled an entirely different group of institutions to emerge – historically Black colleges and Hispanic-serving institutions – and complemented the findings of Leggon and Pearson[13] that were published a year earlier, as well as the seminal study by James M. Jay in 1971.[14] Wolf-Wendel documented the unique, almost exclusive purview of HBCUs in producing Black women in science and the significant role of Hispanic-serving colleges for Latinas. With the focus moving away from individual achievements to institutional productivity, further refinements in research methods would be captured with the use of qualitative case

[11](...continued)
Recent Women's College Graduates. Washington, D.C., 1985; Women's College Coalition. *Studies in Success: Applying Effective Models to Educating Women and Girls,* South Hadley, MA, 1994, and Women's College Coalition. *The Benefits of Women's Colleges.* Washington, D.C., 1995.

[12] Lisa E. Wolf-Wendel, "Models of Excellence: The Baccalaureate Origins of Successful European American Women, African American Women and Latinas," *The Journal of Higher Education.* 69, No. 2, (March/April 1998): 141-189.

[13] See Cheryl B. Leggon and Willie Pearson, Jr., "The Baccalaureate Origins of African American Female Ph.D. Scientists," *Journal of Women and Minorities in Science and Engineering* 3 (1997): 213-224.

[14] See James M. Jay, *Negroes in Science*, 1971, cited earlier.

studies to explore institutional priorities, patterns and principles that have been developed and applied at women's colleges that might inform other efforts to improve women's educational experiences.

Utilizing a sociohistorical approach, the present study is nestled within that genre and complements those efforts. My thesis is that it is the politics of particularlism, not an ideal of universalism, that has fundamentally determined who participates in science and has had a significant impact on HBCUs. Despite constraints, the contributions that these institutions have made to the U.S. scientific workforce have been enormous. Their legacies and documented patterns of student development and degree productivity speak to a shift in how the nation defines, classifies and ranks "top" universities and how policy officials make decisions and allocate resources. The educational strategies developed at these institutions provide model practices for the U.S. higher education system which continues to struggle with attracting, retaining and successfully graduating students who emerge as the next generation of scientists, mathematicians, and engineers.

Mapping the Discussion

The centrality of higher education to the U.S. scientific enterprise has its origins in the post-World War II period. Federal policies channeled billions in funding to support university basic science research, education and training.[15] The principle guiding these

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[15] See, for example, Stuart W. Leslie. *The Cold War and American Science.* New (continued...)

policies, so famously captured in the 1940s rhetoric of MIT-trained engineer Vannevar Bush, held that science served the broader public good and universities were crucial to train the future workforce needed to sustain the country's global economic competitiveness and ensure national security and defense.[16] The late sociologist, Robert Merton, would capture the mores of the community with his thesis of a normative structure of science.[17] Universalism, he argued, ensured that recognition and reward be based on merit and careers be open to talent.

Everyone, however, did not benefit equally. Historically Black colleges and universities, or HBCUs as they are more commonly referred, stood at the fringes of higher education.[18] Clustered primarily in the South, HBCUs were established to provide

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[15](...continued)
York: Columbia University Press, 1993; Alexander J. Morin. *Science Policy and Politics.* Englewood Cliffs, NJ: Prentice- Hall, 1993.

[16] Vannevar Bush. *Science: The Endless Frontier: A Report of the President on a Program for Postwar Scientific Research.* Washington, D.C.: National Science Foundation, 1945, 1960.

[17] Robert K. Merton. *The Sociology of Science.* Chicago: University of Chicago Press, 1973.

[18] The phrase "historically Black college and university" has a very particular meaning and was first introduced in The Higher Education Act of 1965. The Act, as amended, defines an historically Black College or university as: "...any historically Black college or university that was established prior to 1964, whose principal mission was, and is, the education of Black Americans, and that is accredited by a nationally recognized accrediting agency or association determined by the Secretary [of Education] to be a reliable authority as to the quality of training offered or is, according to such an agency or association, making reasonable progress toward accreditation." See

(continued...)

educational access to African Americans during a period in U.S. history when segregationist policies closed doors at mainstream institutions.[19] As the U.S. Supreme Court would later rule in the landmark *Brown versus Board of Education* decision of 1954, separate did not mean equal.[20] The science programs at HBCUs were under-funded, poorly equipped, and designed to prepare the nation's Black population as a servant class.[21] The nation felt non-threatened in channeling newly-freed Blacks into industrial training, but industrial training would prove ineffectual in an emerging society in which wealth would be built around science and technology.[22] Ironically, the constraints that gave birth to HBCUs, based on a notion of separate but equal, also helped to unleash a particular brand of agency that has enabled this sector of institutions to construct environments that produce African American scientists, mathematicians and engineers at rates disproportionate to their numbers in the higher education community.

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[18](...continued)
http://www.ed.gov/about/inits/list/whhbcu/edlite -index.html. (Accessed on 22 Feb. 2005)

[19] Reginald Wilson, "Overview: African American Participation in Higher Education," in Kassie Freeman (ed.) African American Culture and Heritage in Higher Education Research and Practice. (Westport, Connecticut: Prager, 1998, pp. 6-12.

[20] United States of America Supreme Court, *Brown versus Board of Education of Topeka Kansas*, 347 U.S. 483 (1954).

[21] H. Kenneth Bechtel, "Introduction" in Willie Pearson, Jr. and H. Kenneth Bechtel (eds.) *Blacks, Science and American Education.* New Brunswick: Rutgers University Press, 1989. Bechtel, provides one of the most fascinating overviews that connects pre-Civil War ideologies, practices and policies to the formulation of HBCUs and what was considered as acceptable curricula for the education of African Americans.

[22] Ibid..

The nation's 105 HBCUs account for less than one percent of the more than 4,000 colleges and universities, but enroll nearly fourteen percent of African Americans. According to the NSF (2004), an average twenty-nine percent of Black citizens who earned the baccalaureate in science and engineering disciplines for the period 1994-2001 did so at an HBCU.[23] As Table 1.1 reflects, this output is even more striking when examined by degrees in disciplinary clusters – 50 percent in the agricultural sciences, 45 percent in the physical sciences and mathematics, and 42 percent in the biological sciences. The data would also seem to suggest that African Americans attend other institutions at higher numbers when pursuing degrees in non-science disciplines, but select HBCUs when their interests are in the sciences.

[23] National Science Foundation, 2004, p. 53.

Table 1.1
Science and Engineering (S&E) Bachelor's Degrees
Awarded to Black U.S. Citizens
by Historically Black Colleges and Universities, 1994-2001

	1994	**1995**	**1996**	**1997**	**1998**	**2000**	**2001**
Fields	**Number (Percent)**						
S&E	7,804 (*29.7*)	8,361 (*30.4*)	8,980 (*30.9*)	9,071 (*29.8*)	9,151 (*29.1*)	8,773 (*26.2*)	8,682 (*26.1*)
Non S&E	15,622 (*27.9*)	15,628 (*27.1*)	16,445 (*27.2*)	16,144 (*26.2*)	16,395 (*25.4*)	16,785 (*23.7*)	16,460 (*22.4*)
Select Sciences							
Agricultural	134 (*50.0*)	123 (*46.8*)	197 (*54.3)*	216 (*55.8*)	220 (*51.6*)	218 (*47.6*)	198 (*46.3*)
Biological	1,197 (*40.2*)	1,357 (*42.0*)	1,628 (*42.7*)	1,841 (*44.7*)	1,920 (*42.2*)	1,884 (*39.8*)	1,943 (*41.1*)
Computer Science	904 (*37.7*)	967 (*38.7*)	979 (*40.5*)	834 (*35.2*)	904 (*35.0*)	987 (*29.6*)	1,220 (*28.4*)
Mathematics	449 (*45.3*)	466 (*46.8*)	443 (*45.2*)	478 (*44.6*)	442 (*42.9*)	427 (*44.0*)	345 (*42.7*)
Physical	421 (*45.7*)	471 (*45.6*)	547 (*49.7*)	503 (*45.3*)	485 (*43.0*)	496 (*43.5*)	471 (*44.8*)
Engineering	690 (*25.9*)	798 (*28.0*)	894 (*29.8*)	905 (*29.4*)	843 (*27.9*)	694 (*22.7*)	669 (*23.2*)

Source: National Science Foundation, Division of Science Resources Statistics, *Women, Minorities and Persons with Disabilities in S&E: 2004*, NSF 04-317 (Arlington, VA, 2004). The physical sciences include earth, atmospheric and ocean sciences; physics; astronomy; and chemistry.

Spelman College, one of two surviving HBCUs for women,[24] has exhibited high rates of student degree attainment. Founded in 1881 in the South by two white New England missionaries, the institution was originally established as a seminary where former slave women and girls could learn to read and write, develop good moral character, and become teachers in the community.[25] The concept of a liberal arts education to support the development of Black scientists ran counter to late nineteenth-century sensibilities of what these women could, or should be.[26] Even after the institution began awarding college degrees in 1901 and won accreditation in 1956, Spelman maintained its reputation as a place where Black women were educated to become teachers and homemakers in the community.

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[24] The other historically Black institution for women is Bennett College in Greensboro, North Carolina. Bennett, however, was originally founded as a coeducational institution 1876, and was re-organized as a women's college in 1926. Nonetheless, Bennett also produced significant numbers of Black women scientists throughout the period covered by this research. Leggon and Pearson conclude that "of the 27 biological scientists with baccalaureate origins in women's colleges, 18, or two-thirds, earned their baccalaureate degrees in the two historically Black women's colleges – Spelman and Bennett." See Cheryl B. Leggon and Willie Pearson, Jr., "The Baccalaureate Origins of African American Female Ph.D. Scientists," in *Journal of Women and Minorities in Science and Engineering*, vol. 3 (1997): 213-224.

[25] Florence Matilda Read. *The Story of Spelman College*. Princeton, NJ: Princeton University Press, 1961.

[26] For a greater discussion of societal perceptions of the image of Black women following the end of the Civil War, see Beverly Guy-Sheftall and Jo Moore Stewart. *Spelman: A Centennial Celebration*. Atlanta, GA: Spelman College, 1981. See also Jeanne L. Noble. *The Negro Woman's College Education*. New York: Columbia University Press, 1956.

In the late 1960s, however, two Black female mathematicians, only the ninth and twelfth in the United States to earn doctorates in the field,[27] questioned the College's commitment to educating African American women in science. The conscious-raising of the time held that the exclusion of Blacks and women from many fields had reached the beginning of its end. This exclusion was especially acute in the sciences. But the national rhetoric did not match the curricular offerings at Spelman College. The chemistry curriculum was little more than a service course for students pursuing majors in home economics or physical education, and those with any science interests outside of home economics or pre-medicine had to petition to take the majority of their courses at neighboring colleges in the Atlanta University Center.[28]

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[27] The chronology of Black women who have earned U.S. doctorates is a fluid list, changing as more information is uncovered and substantiated. Until 2001, Evelyn Boyd Granville, who earned the Ph.D. in 1949 from Yale University, had been considered the first. Granville, however, was replaced by Euphemia Lofton Haynes, who earned the Ph.D. from Catholic University in 1943. Some lists fail to recognize Georgia Caldwell Smith, who passed the oral defense in 1960 for a degree from the University of Pittsburgh, but died before it was conferred (which the university did posthumously in 1961). My chronology includes Smith. Similarly, Scott Williams, professor of mathematics at the State University of Buffalo, lists several other Black women who earned the doctorate in mathematics before McBay and Falconer., including Argelia Velez-Rodriguez, who earned the Ph.D. from the University of Havana in 1960 and became a naturalized U.S. citizen in 1972. I do not list Velez-Rodriguez, as I am concerned with African Americans; nor do I list the to others that are cited in te the Williams website as I have not been able to substantiate their credentials. As such, Mathis and Falconer emerge as the ninth and eleventh based on the number of known and substantiated African American female doctoral degree recipients who earned the Ph.D. in mathematics from U.S. institutions.

[28] Etta Z. Falconer, "A Story of Success: The Sciences at Spelman College," *SAGE* VI, No. 2 (Fall 1989): 3-38.

The two women saw few professional role models in science during their own academic journey, raised as they were in segregated communities in the South. They wanted to put in place a structure that would enable this younger and future generations to have what they didn't – access to other women in science who looked like them and the benefit of an educational environment that nurtured their growth. So, with the eventual support of the institution's president, and aided by an alumna physician, the two seized the moment in the early 1970s to work with faculty to reinvent and build Spelman's science program.

Over the next two decades, departments were added to eventually include biology, chemistry, mathematics, computer science, physics and a dual degree program in engineering. The core curriculum was complemented by academic-year and summer programs to increase student recruitment, retention and graduation. The course load was decreased from four courses per semester to three, and the institution actively recruited and hired faculty with doctoral degrees and active research portfolios. By the 1990s, the number of science graduates increased by more than 470 percent, from 28 in 1968 to 132 in 1996.[29]

The validation of Spelman College's role in contributing to the human resources needed to sustain the U.S. scientific enterprise was acknowledged in 1995 when the National Science Foundation named Spelman a model institution for excellence in undergraduate

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29 Spelman College *Fact Book,* 1998-99.

science and mathematics education. Spelman students not only completed the baccalaureate, but persisted to the doctoral degree. As Table 1.2 reflects, for the period 1997-2001, the NSF ranked Spelman among the top 15 baccalaureate-origin institutions graduating African Americans in the sciences who went on to earn the doctoral degree in science disciplines.[30] Even though this ranking includes the social and behavioral sciences, the achievements are striking given the size of the college (an average of 1500 students for the period), the rate of growth, and the major universities who are included in the comparison. Now, under the loose heading of a national reform movement, educators nationally are recommending the kinds of strategies that Spelman put in place nearly 30 years ago.

[30] American Association for the Advancement of Science. *Standing Our Ground*. Washington, D.C.: AAAS, 2004. These figures include social, behavioral and economic science disciplines.

Table 1.2
Top 15 Baccalaureate-Origin Institutions of African Americans Earning The Ph.D. in STEM Disciplines, 1997-2001

1. *Howard University*
2. *Spelman College*
3. *Hampton University*
4. *Morehouse College*
5. Massachusetts Institute of Technology (MIT)
6. Harvard University
7. *North Carolina A&T State Univ.*
8. *Southern University*
9. Univ. Of California, Berkeley
10. Univ. Of Maryland
11. Univ. Of Michigan
12. Stanford University
13. *Xavier University of Louisiana*
14. *Jackson State University*
15. North Carolina State University

Source: Commission on Professionals in Science and Technology as compiled in American Association for the Advancement of Science. *Standing Our Ground*. Washington, DC: AAAS, 2004. Institutions in italic are HBCUs.

Areas of Focus

By science, I am limiting my discussion to the physical, natural, computer and mathematical sciences, disciplines which have shown the least amount of gains by African Americans generally and African American women specifically. In 2001, African Americans constituted seven percent of bachelor's degrees awarded, as compared to 70 percent for whites citizens and nearly 12 percent for Asian Americans. Given that African Americans comprise 12 percent of the U.S. population and Asian-Americans only four percent, the disparity becomes apparent.

Table 1.3
Science and Engineering (S&E) Bachelor's Degrees Awarded By Field and Race/Ethnicity, 2001

	All U.S. Citizens/ Permanent Resident	**White**	**Asian/ Pacific Islanders**	**Black**
Fields	**Number of Degrees**			
All Fields	1,218,169	888,412	75,496	106,648
All S&E	384,492	267,848	36,398	33,290
Select Science Disciplines				
Agricultural	17,219	14,950	399	428
Biological	60,652	41,325	7,493	4,693
Computer Science	39,792	24,491	6,326	4,291
Earth, Atmospheric, Ocean	3,919	3,436	86	56
Mathematics	11,029	8173	916	808
Physical	13,605	9,812	1,344	996
Engineering	54,839	38,767	7,025	2,884
Non S&E	833,677	620,564	39,098	73,358

Source: National Science Foundation, Division of Science Resources Statistics, *Women, Minorities and Persons with Disabilities in S&E: 2004,* NSF 04-317 (Arlington, VA, 2004). The physical sciences include astronomy, chemistry, physics, and chemistry.

Table 1.4
Science and Engineering (S&E) Bachelor's Degrees
Awarded To Women By Field and Race/Ethnicity, 2001

	All U.S. Citizens/ Permanent Resident	**White**	**Asian/ Pacific Islanders**	**Black**
Fields	**Number of Degrees**			
All Fields	702,996	504,580	41,291	70,270
All S&E	196,328	132,664	17,423	21,327
Select Science Disciplines				
Agricultural	8,362	7,121	256	261
Biological	36,227	24,286	4,280	3,367
Computer Science	10,844	5,448	2,046	1,989
Earth, Atmospheric, Ocean				
Mathematics	5,337	3,928	434	451
Physical	7,285	5,202	700	604
Engineering	11,137	7,057	1,684	1,026
Non S&E	506,668	371,916	23,868	48,943

Source: National Science Foundation, Division of Science Resources Statistics, *Women, Minorities and Persons with Disabilities in S&E: 2004*, NSF 04-317 (Arlington, VA, 2004). The physical sciences include astronomy, chemistry, physics, and chemistry.

For Black women, the percentages are a little higher, as the trend has been for women generally since 1996. The NSF reports African American women earned nearly 10 percent of bachelor's degrees in the target disciplines, as compared to 67 percent for white female citizens and twelve percent for Asian Americans/Pacific Islanders. What is interesting about the data is the low number of African American women earning degrees in the biological sciences, given the historical emphasis of women pursuing degrees in biology as a path to clinical medicine. For all women, the degree attainment in mathematics and the physical sciences continue to be extremely low.

I briefly compare the history of Spelman, and its focus on creating a culture and educational environment that could nurture Black women scientists, to the history, efforts and achievements of northeastern women's colleges which exhibit comparable rates of female baccalaureate degree attainment in science, mathematics and engineering disciplines. Women and women's institutions share with African Americans and HBCUs common histories of marginalization and structural limitations, but there are fundamental distinctions in how these disparities would eventually play out.

Nearly two centuries after the founding of Harvard University in 1636 (which was only open to men), communities in Massachusetts began to experiment with high school education for girls, or seminaries. The curriculum stressed morals, mind and manners, and the institutions would develop a particular niche in teacher education.[31] Not all women were content to become teachers and sought full educational citizenship. Established in 1865, Vassar, became the first full-fledged woman's college, followed by

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[31] Myra Sadker and David Saker. *Failing at Fairness: How Our Schools Cheat Girls*. New York: Simon & Schuster, 1994.

others in the northeast whose curricular offerings focused on music, art, elocution and other courses thought to refine a woman. By 1886, women's institutions were establishing policies that directed students away from ornamental subjects and began developing academic channels that included college-level curricula that closely reflected offerings at men's institutions.[32] Margaret Rossiter (1982) argues that this great transformation in women's education, from informal learning to academies and seminaries to colleges, would have a profound impact on the ability of women to study science systematically and ultimately enter scientific professions, and that the single-sex college for women would provide the "entering wedge."[33] As Rossiter further argued, access did not equate with parity. Women scientists were powerless in the profession.

The social upheavals of the late 1960s and 1970s produced a body of literature that began to question the validity of a normative structure of science and its focus on universalism, particularly in the face of the experiences of women, mainly white women. These literatures, which will be examined more closely in Chapter 2, have helped to develop the analytical tools to better understand gender stratification in the *manner* and *matter* of science. The challenge now lay in extending this analysis at the micro level to issues of race that expands upon current statistical analyses and individual biographies.

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[32] Ibid.

[33] Margaret W. Rossiter. *Women Scientists in America; Struggles and Strategies to 1940.* Baltimore and London: The Johns Hopkins University Press, 1982, p. 28.

Methodology

My research methodology includes the examination of both primary and secondary sources culled from the archival holdings at Spelman College, Bryn Mawr College, and the Woodruff Library at the Atlanta University Center. I also interrogate other traditional resources, including journal and newspaper articles, monographs, statistical studies and government documents.

The Spelman archives contain an exhaustive collection of institutional records dating from the college's founding. Notable amongst these items are the diaries of co-founders Sophia B. Packard and Harriet E. Giles; and more recently, the personal papers of the college's first African American female president, Johnnetta Betsch Cole. However, many other records pertaining to each of the other five HBCUs which comprise the Atlanta University Center consortium, of which Spelman is a member, are housed in and maintained by the Archives and Special Collections Division of the Woodruff Library, which serves each of the member institutions. The history of these other institutions, in particular, Morehouse College and Clark Atlanta University (previously Clark College and Atlanta University), are intricately tied to the history of Spelman College and its science program.

Because I briefly situate Spelman within the history of women's education and compare the Spelman science program to those at the northeastern women's colleges, it was necessary to access institutional records and documents at those institutions. I selected

Bryn Mawr. Located in Pennsylvania, Bryn Mawr is the smallest of these seven institutions, is comparable in size to Spelman, and was the most productive baccalaureate-granting institution for white women who earned doctorates between 1975 and 1985.[34] In addition to examining Bryn Mawr's archival holdings, I also conducted on-site interviews with faculty and administrators at Bryn Mawr (ranging in length from 30 minutes to an hour) to gather their perceptions about institutional factors that contribute to Bryn Mawr's high rates of student baccalaureate science degree attainment.[35] While comments from those interviews are not provided in this study (I hope to use the information in a future project), other background information based on the research is contained in Chapter 4.

From my own vantage, I found the oral interviews with Spelman alumnae, faculty and administrators particularly interesting and revealing. Here, I chose a cross-section of Spelman alumnae who graduated with degrees in science during the 1970s, the time at which the institution began an aggressive plan of intervention, re-invention and

[34] M. Elizabeth Tidball, et al. *Taking Women Seriously: Lessons and Legacies for Educating the Majority*, Phoenix, AZ: The American Council on Education and the Orynx Press, 1999.

[35] Tidball undertook a similar on-site case study analysis, comparing institutional factors at Bryn Mawr with those at Bennett College for Women, the only other surviving HBCU for women. Similar to Spelman, the Greensboro, North Carolina-based Bennett evidenced high rates of African American female baccalaureate-degree production in science disciplines but was selected over Spelman for analysis by Tidball because "it has received less attention from the media and has had fewer write-ups in the academic literature." Tidball, 1999, p. 195

expansion. The alumnae interviewed are far from being classified as a sample. The group is too small and doesn't include any computer science, physics or chemistry majors. Limited resources and time prevented reaching out to a broader pool.

The selection of the alumnae was based on consultation with staff in Spelman College's Office of Alumnae Affairs, career paths, and accessibility. Similar to the interviews conducted at Bryn Mawr, interview sessions ranged from 30 minutes to nearly two hours, depending upon availability and the extent of the responses. My questions primarily focused on the interviewees' family background and childhood experiences (how they came to be interested in science), their reasons for choosing to matriculate at Spelman and major in science or mathematics or pursue the dual degree in engineering, and the impact of the Spelman experience as compared with their later matriculation at predominately white, co-educational graduate institutions. This last question was designed to solicit the respondent's perception about the of impact of race and gender. One observation that resonated consistently amongst all interviewees was the importance of having visible and accessible African American female scientist mentors and role models. The respondents were less decisive about the impact of region, institutional size and setting and curricular rigor. Interviewee responses are dispersed throughout each of the chapters.

CHAPTER 2

THEORETICAL FRAMEWORK:

NORMATIVE STRUCTURE, A PUBLIC CONTRACT, AND THE METAPHORIC PIPELINE

> The shortage of blacks among the ranks of scientists, engineers, and mathematicians. . . needs to be understood by reviewing past ideologies, practices, policies, and expectations of whites and blacks. It is necessary to examine the sociohistorical links among attitudes about race, educational policies, and the social structure of science. All three have worked to prevent blacks from entering science or from having their scientific contributions acknowledged and rewarded.
>
> H. Kenneth Bechtel, *Blacks, Science, and American Education,* 1989

This study draws on and reacts to literatures in the history and sociology of science and contemporary discourse within the field of science policy. The corpus of these literatures are varied, but when whittled down to race, gender and organizational setting, the selection becomes quite small. The title itself, *The Politics of Particularism,* attempts to place the history and circumstances of HBCUs, and the Black citizens they were established to serve, within the context of a normative structure of science as articulated by the late sociologist Robert Merton.[36] Merton argued that scientists are part of a distinct community and the "man of science" guided by a core set of ethos that enabled him to act nobly and objectively. The ethos of universalism is most relevant to this research. [37] It posits that truth claims are subjected to pre-established impersonal criteria, that recognition and rewards are based on merit; and by logical extension, careers are open to talent.

The last several decades have produced a body of literature that have criticized Merton's normative structure as functionalist, insular, and insufficient to explain behavior when disconnected from an analysis of competing individual interests and the influence of larger economic and political structures, both nationally and internationally.[38] The theory also under-adjusts for the dichotomy that exists between a supposed value-free

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[36] Robert K. Merton, 1973.

[37] The other three ethos that constitute the normative structure include *communism*, or the common ownership of scientific ideas, theories, and findings; *disinterestedness*, or the passion for knowledge as the unencumbered driving force of inquiry and discovery; and *organized skepticism*, or the notion that scientists should maintain a sense of detached judgement and scrutiny, focusing solely, instead, on the facts. (p. 270-73).

[38] Karin Knorr Cetina, "Merton's Sociology of Science: The First and the Last Sociology of Science," in *Contemporary Sociology* 20, No. 4 (July 1991): 522-526. For a defense of Merton and his contribution to the sociology of science, see Stephen Cole, "Merton's Contribution to the Sociology of Science," *Social Studies of Science* 34, No. 6 (December, 2004): 841-844.

normative structure and value-laden reward system.

Pierre Bourdieu (1975) argued that science is not a distinct realm, but like other fields, is susceptible to and characterized by competing interests and power struggles.[39] Barry Barnes (1974),[40] David Bloor (1976),[41] and sociologists doing early work in constructivism argued that the natural world is socially constructed and scientific knowledge is the product of social processes. Latour and Woolgar (1979)[42] and Knorr-Cetina (1981, 1983)[43] would attempt to link micro- and macro-level analyses within an actor-network framework to examine how truth claims come to be constituted and accepted, and the influence of broader political, economic and social factors in the process. While the social constructivist approach has proved useful in showing that

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39 Pierre Bourdieu, "The Specificity of the Scientific Field and the Social conditions for the Progress of Reason," in *Social Science Information* vol.14, no.5 (1975): 19-47

40 Barry Barnes. *Scientific Knowledge and Sociological Theory*. London and Boston: Routledge & K. Paul, 1974.

41 David Bloor. *Knowledge and Social Imagery*. London: Routledge & Kegan, 1976.

42 Bruno Latour and Steve Woolgar. *Laboratory Life: The Social Construction of Scientific Facts.* Princeton, N.J.: Princeton University Press, c1986.

43 Karin Knorr-Cetina. *The Manufacture of Knowledge: An essay on the Constructivist and Contextual Nature of Science*. New York: Oxford/Pergamon Press, 1981; and "The Ethnographic Study of Scientific Work–Towards a Constructivist Interpretation of Science," in Karin Knorr-Cetina and Michael Mulkay (eds.). *Science Observed: Perspectives on the Social Study of Science*. London and Beverly Hills: Sage Publications, 1983.

science does not exist separate from the rest of society, work by these early scholars was curiously silent on issues of race and gender and how these particularlistic characteristics influence the manner and matter of science.[44]

These shortcomings notwithstanding, the analytical tools employed by social constructivists are useful for the study at hand. Bechtel (1989) argues that attitudes about race, U.S. educational policies and the social structure of science have "worked to prevent blacks from entering science or from having their scientific contributions acknowledged and rewarded."[45] Given what has now surfaced and been substantiated about the deliberately neglected contributions of Black scientists, medical researchers and engineers, how might a social constructivist approach help to explain this phenomena in the face of a so-called normative structure? By extension, how might a social constructivist approach help to explore more fully the marginal position of the science programs at Black colleges – in spite a *de facto* policy that poured millions into science human resource development? Bechtel traces the causes for this marginalization in his sociohistorical overview. Several specific HBCUs are mentioned, though no analysis is done in detail. Further, there is no discussion of the specific contributions of Black women.

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[44] For similar research that combines the sociology and history of technology, see Wiebe E. Bijker, et al. *The Social Construction of Technological Systems.* Cambridge and London: The MIT Press, 1994.

[45] Bechtel, 1989 p. 2

Feminists and scholars of women's studies have focused particular attention on Merton's assertion of an ethos of universalism. Long and Fox (1995)[46] and Fox (1999)[47] argue that science is far from universalistic, but is particularlistic in its culture and practice. Universalism versus particularlism remains at issue because the former provides a seemingly objective basis upon which to continue to reap greater rewards and recognition (or what Merton describes as the Matthew effect of cumulative advantage) upon those who already seem to be in an advantageous position while continuing to stratify and discriminate against those [particular] groups who seem to be in a disadvantageous position or "can't make the cut."

Long and Fox contend that performance is not simply a function of motivation or ability, but is also the result of organizational context.[48] The two found higher proportions of women and Blacks in comprehensive and liberal arts colleges, institutions where resources for research are low and teaching loads are high. These factors affect performance and rewards and ultimately scientific stature.[49] The fact that minorities and women are under-represented in the field has less to do with abilities that these groups

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46 J. Long Scott and Mary Frank Fox, "Scientific Careers: Universalism and Particularism," *Annual Review of Sociology*. 21 (1995): 45-71.

47 Mary Frank Fox, "Gender, Hierarchy, and Science," iIn Janet Saltzman. *Handbook of the Sociology of Gender.* New York: Kluwer Academic/Plenum Publishers, 1999.

48 Ibid, p. 61

49 Long and Fox, 1998.

somehow lack the intelligence to acquire, but with *structural limitations* that have a specific historical foundation and political context.[50]

Long and Fox, however, were not the first to recognize the role of institutional context. M. Elizabeth Tidball (1970) broke new ground in applying baccalaureate-origin studies to women and statistically documented the high rate at which women's institutions produce high achievers; that is, women who gained recognized career achievement based on self-reported biographical entries in the national register *Who's Who of American Women.*[51] Tidball found that achievers graduating from women's colleges were not different than achievers graduating from co-educational institutions. The difference was the *rate* at which these two types of institutions produced achievers, with the women's

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[50] For additional literature examining gender-based stratification in science, see Jonathan Cole. *Fair Science: Women in the Scientific Community*. New York: The Free Press, 1979; Harriet Zuckerman, et al. (eds.) *The Outer Circle: Women in the Scientific Community*. New York: Norton, 1991; Sandra Hanson. *Lost Talent: Women in the Sciences*. Philadelphia: Temple University Press, 1996; and Gerhard Sonnert and Gerald Holton. *Gender Differences in Science Careers*. New Brunswick: Rutgers University Press, 1995; and Gerhard Sonnert and Gerald Holton. Who Succeeds in Science: The Gender Dimension. New Brunswick: Rutgers University Press, 1995.

[51] M. Elizabeth Tidball, "Women's Colleges vs. Coeducation: A Question of Creative Involvement?"*Mount Holyoke Alumnae Quarterly* 54 (1970): 176-78. Baccalaureate-origins as a unit of analysis was first applied by Knapp and Goodrich in 1951 under a Carnegie-sponsored study of the baccalaureate-origins of men doctoral scientists. The two developed a productivity index to chart the rate at which male graduates between the years 1924 and 1934 continued to the doctoral level and were listed in the registry, *American Men of Science.* They found that among the 50 most productive institutions, most were small liberal arts colleges. See, Robert H. Knapp and Hubert B. Goodrich. "The Origins of American Scientists." *Science*. 113 (May 11, 1951): 543-45.

colleges producing twice as many achievers as the co-educational institutions.[52]

Twenty-five years later, Tidball and Kistiakowsky (1976) would analyze institutional productivity for both men and women separately.[53] The two expanded on earlier work in the field by dis-aggregating the data according to sex and doctoral fields. In the case of women, Tibdall and Kistiakowsky found that half or more of the most productive colleges were women's colleges and that there were distinct differences in the baccalaureate origins of women and men who have earned doctorates.[54]

Revisiting the topic in 1986, Tidball again found that women's colleges topped the list as the baccalaureate-origin institution of female natural science doctorates.[55] As reflected in Figure 1.1 below, women's colleges were even more productive than private universities with substantive graduate programs in the natural sciences. Overall, however, colleges, as opposed to universities, emerged as the baccalaureate-origin institutions for women scientists.

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[52] Ibid.

[53] M. Elizabeth Tidball and Vera Kistiakowsky, "Baccalaureate Origins of American Scientists and Scholars," *Science*. 193 (Aug. 20, 1976): 646-652.

[54] Ibid.

[55] M. Elizabeth Tidball, "Baccalaureate Origins of Recent Natural Science Doctorates," *Journal of Higher Education*. 57, No. 6 (Nov. - Dec., 1986), 606-620.

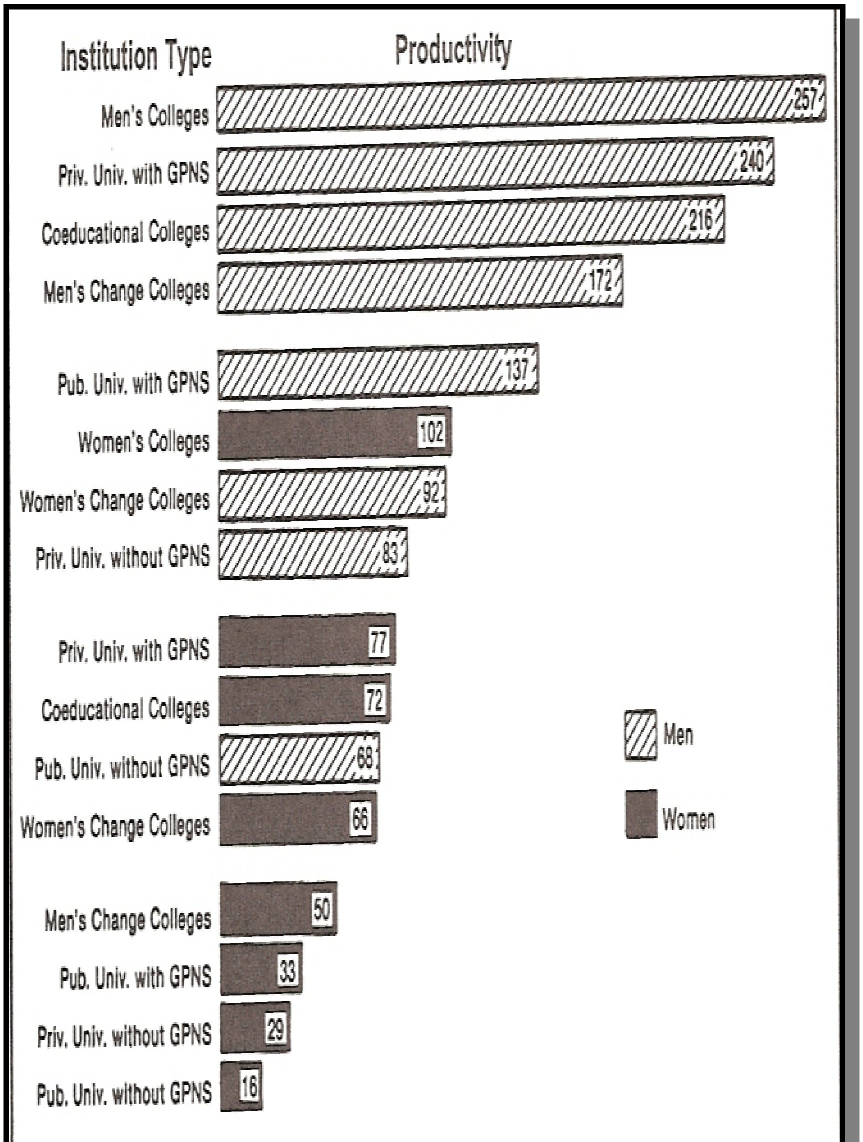

Figure 2.1. Most Productive Institution Type for Natural Science Doctorates. Source: M. Elizabeth Tidball, et al. *Taking Women Seriously.* Phoenix, AZ: American Council on Education and the Oryx Press, 1999, 45
Notes: GPNS: Graduate Program in the Natural Sciences Productivity: (doctorates ÷ graduates) x 10,000

The Women’s College Coalition (WCC) continued to explore the productivity rates of women’s colleges and the effect of environment on choice of major.[56] Established in 1972 in the wake of affirmative action legislation and debates concerning the relevancy of single-sex institutions, the WCC found that women at women’s colleges were 1.5 times more likely to earn bachelor’s degrees in the life science, the physical sciences, or mathematics than women at co-educational institutions.[57]

The work of the WCC, coupled with the body of research by Tidball, continued to affirm and document the significant role of women’s institutions in producing at the baccalaureate level women with degrees in sciences and other traditionally male-dominated disciplines. The studies, however, were primarily statistical analyses that lumped all women, irrespective of race and other particularlistic characteristics. The work did not examine, in any detail, change over time or particular institutional actors

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[56] The Women's College Coalition is an association of women's colleges and universities – public and private, independent and church-related, two- and four-year – in the United States and Canada whose primary mission is the education and advancement of women. According to the organization’s website, the WCC makes the case for women's education to the higher education community, to policy makers, to the media and to the general public. Additionally, the Coalition collects and disseminates information relating to the education of women and gender equity in education. See http://www.womenscolleges.org [Accessed on 10 June 2006]

[57] as cited in J.S. Sebrechts, “Cultivating Scientists at Women’s Colleges,” *Initiative*s. 55, No. 2 (1995): 45-52. See, also Women’s College Coalition. *A Study of the Learning Environments at Women’s College*. Washington, D.C., 1981; Women’s College Coalition. *A Profile of Recent Women’s College Graduates.* Washington, D.C., 1985; Women’s College Coalition. *Studies in Success: Applying Effective Models to Educating Women and Girls*, South Hadley, MA, 1994; and Women’s College Coalition. *The Benefits of Women’s Colleges*. Washington, D.C., 1995.

who influenced the education process and institutional environment. The implicit assumption, as also reflected in Figure 1.1, was that *all* women fared better at women's institutions.

Wolf-Wendel (1998)[58] disrupted this notion when she began to study baccalaureate origins and dis-aggregate by race.[59] She echoed the arguments posited by Carter, Pearson and Shavlik (1988),[60] Guy-Sheftall and Bell-Scott (1989)[61] and others[62] who asserted that

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[58] Lisa E. Wolf-Wendel, "Models of Excellence: The Baccalaureate Origins of Successful European American Women, African American Women and Latinas," *The Journal of Higher Education*, 69, No. 2 (March/April 1998): 141-189

[59] The initial publication of Wolf-Wendel's work in 1998 emanated from her doctoral dissertation, which she completed at the Claremont Graduate School in 1995. However, Wolf-Wendel would not be the first to dis-aggregate baccalaureate origin by race. Leggon and Pearson (1997) conducted similar work and published their findings in 1997. See, Cheryl B. Leggon ad Wilie Pearson, Jr., "The Baccalaureate Origins of African American Female Ph.D. Scientists," *Journal of Women and Minorities in Science and Engineering*, 3 (1997): 213-224.

[60] D. Carter, C. Pearson and D. Shavlik, "Double Jeopardy: Women of Color in Higher Education," *Educational Record* 69 (Fall/Winter, 1988): 98-103.

[61] Beverly Guy-Sheftall and Patricia Bell-Scott. "Finding A Way: Black Women Students in the Academy," in C.S. Pearson, D.L. Shavlik and J.G. Touchton (eds.) *Educating the Majority: Women Challenge Tradition in Higher Education.* New York: American Council on Education, 1989.

[62] See also S. E. Melendez and J. Petrovich, "Hispanic Women Students in Higher Education: Meeting the Challenge of Diversity," in C.S. Pearson, D.L. Shavlik and J.G. Touchton (eds.) *Educating the Majority: Women Challenge Tradition in Higher Education.* New York: American Council on Education, 1989; Y.T. Moses. *Black Women in Academe: Issues and Strategies*. Washington, D.C.: Project on the Status and Education of Women, Association of American Colleges, 1989; and S. Nieves-Squires. *Hispanic Women Making Their Own Presence on Campus Less Tenuous*. Washington, (continued...)

the situation faced by women students is not the same across racial and ethnic groups and that referring to women as a homogenous group masks significant differences in both access to and experiences in higher education. Wolf-Wendel wanted to better understand which institutions and which institutional types graduate the largest proportions of successful women from different racial/ethnical groups and what institutional factors are associated with this success.[63]

Tables 2.1 and 2.2 below illustrate the Wolf-Wendel findings. As the author points out, if there had been no dis-aggregation by race or ethnic group, the productivity of many of the HBCUs and Hispanic-serving colleges would not have emerged.[64] This statement, however, is not altogether accurate. Leggon and Pearson reached similar findings a year earlier and James Jay documented the role of HBCUs in serving as the undergraduate-origin institution for African American female doctorate holders as early as 1970.[65]

This oversight notwithstanding, the findings by Wolf-Wendel reveal several interesting facts. Of the top 10 productive institutions for European American women, not one on either table is located in the South, begging the question about the impact and role of

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[62](...continued)
D.C.: Project on the Status and Education of Women, Association of American Colleges.

[63] Wolf-Wendel, 1998, p. 142

[64] Tidball, 1999.

[65] See Leggon and Pearson, 1997 and James M. Jay, 1971, both cited earlier.

geographic region and questions of why no southern white women's college has been able to effect the type of convergence that exists at Spelman or to create for females in the south the type of environment that exists in the northeast. Table 2.1 shows that two of the top 10 institutions for European American women (Bryn Mawr and Barnard) seem to have developed some measure of success with Latina women who eventually pursue and earn the doctorate (though doctoral field is not specified). The same, however, does not seem to hold true for African American women. The top 10 baccalaureate-origin institutions for African American earning the doctoral degree are HBCUs.

Table 2.1
Baccalaureate Institutions Identified as *Who's Who* Productivity Leaders

European American Women	**African American Women**	**LatinaWomen**
Barnard College (Women's)	Bennett College (Women's/HBCU)	Barnard College (Women's)
Bennington College (Women's College)	Fisk University (CoEd/HBCU)	Barry University (W. Change)
Byrn Mawr College (Women's)	Howard University (CoEd/HBCU)	Bryn Mawr College (Women's)
Connecticut College (W. Change)	Knoxville College (CoEd/HBCU)	Incarnate Word College (W. Change)
Manhattanville (W. Change)	Lincoln University (CoEd/HBCU)	University of Miami (CoEd)
Radcliffe College (W. Change)	Mills College (Women's)	New Mexico Highlands University (CoEd)
Sarah Lawrence College (W. Change)	Saint Mary College (Women's)	Our Lady of the Lake University (W. Change)
Smith College (Women's)	Spelman College (Women's/HBCU)	Pomona College (CoEd)
Vassar College (W. Change)	Stillman College (CoEd/HBCU)	Texas A&I University (CoEd)
Wellesley College (Women's)	Tougaloo University (CoEd/HBCU)	Texas Women's University (Women's)

Source: Lisa Wolf-Wendel, "Models of Excellence: The Baccalaureate Origins of Successful European American Women, African American Women and Latinas." Doctoral Dissertation, The Claremont Graduate School, 1995 as cited in Tidball, 1999, p. 38
Notes: W. Change refers to colleges formerly for female sudents only. M. Change refers to colleges formerly for male students. Institutions are listed in alphabetical order.

Table 2.2
Baccalaureate-Origin Institutions Identified as Doctorate Productivity Leaders

European American Women	African American Women	Latina Women
Barnard College (Women's)	Bennett College (Women's/HBCU)	Barnard College (Women's)
Byrn Mawr College (Women's)	Fisk University (CoEd/HBCU)	Barry University (W. Change)
Goucher College (Women's)	Hampton University (CoEd/HBCU)	Bryn Mawr College (Women's)
Mount Holoyke College (Women's)	Howard University (CoEd/HBCU)	Incarnate Word College (W. Change)
Radcliffe College (W. Change)	Lincoln University (CoEd/HBCU)	University of Miami (CoEd)
Sarah Lawrence College (W. Change)	Morgan State University (CoEd/HBCU)	Our Lady of the Lake University (W. Change)
Smith College (Women's)	Spelman College (Women's/HBCU)	Pan American, University of (CoEd)
Swarthmore College (CoEd)	Taladega College (CoEd/HBCU)	Pomona College (CoEd)
Vassar College (W. Change)	Tougaloo University (CoEd/HBCU)	Texas A&I University (CoEd)
Wellesley College (Women's)	Tuskegee University (CoEd/HBCU)	Texas Women's University (Women's)

Source: Lisa Wolf-Wendel. "Models of Excellence: The Baccalaureate Origins of Successful European American Women, African American Women and Latinas." Doctoral Dissertation: The Claremont Graduate School, 1995, as cited in Tidball, 1999, 42
Notes: W. Change refers to colleges formerly for female students only. M. Change refers to colleges formerly for male students. The top 10 institutions are listed in alphabetical order.

Several other findings of the Wolf-Wendel bear mentioning in the current study. Firstly, for European-American women, all previous claims were reconfirmed – women's colleges consistently graduate significantly higher proportions of successful European American women than co-educational institutions, even prestigious research universities. The second finding focuses on African American women. While predominantly white women's colleges are more productive than co-educational, predominately white institutions, Wolf-Wendel reconfirmed previous research which found that it is the historically Black college that evidences greater productivity rates overall. Most interestingly, the nation's two historically Black women's colleges – Spelman and Bennett – not only outproduced co-educational and single-sex predominately white institutions, but also the historically Black co-educational ones. Finally, Wolf-Wendel found that Hispanic-serving women's colleges significantly outproduce all other institutional types in graduating successful Latinas. Given the lack of overlap among successful institutions between groups of women, Wolf-Wendel found that both institutional gender and institutional race are important factors.[66]

While the 1998 Wolf-Wendel study began to identify institutional types that influence female baccalaureate degree attainment in the sciences given racial/ethnic characteristics, the research was still narrowly focused on the use of statistical methodology. None of the earlier studies, including that of Wolf-Wendel, examined the female students

[66] Ibid.

themselves, policies and practices (including curricular and co-curricular offerings) at the institutions, changes over time in those policies and practices, or the attitudes, behaviors and efforts of individual actors.

Tidball et al. (1999) would address this concern with the publication of *Taking Women Seriously*.[67] The authors sought to highlight institutional priorities, patterns and principles that have been developed and applied at women's colleges that might inform other efforts to improve women's educational experiences. Using qualitative case studies to highlight institutional policies and practices among a cross-section of women's institutions, the authors explore ways in which the selected colleges have responded to their commitment "to take women seriously."[68] The authors argue that "what is essential is not to be found in quantifiable categories" but in common traits that seem to be present

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[67] M. Elizabeth Tidball et al. *Taking Women Seriously: Lessons and Legacies for Educating the Majority*. Phoenix, AZ: American Council on Education and the Oryx Press, 1999.

[68] Of particular note is the comparative analysis of the policies and practices that influence environments at Byrn Mawr and Bennett colleges. Byrn Mawr is a predominately white, resource-rich women's college in a suburb of Pennsylvania which, at the time of the study in 1993, produced women physics majors at 29 times the national average, and was one of only five liberal arts colleges with the highest percentage of winners of the NSF Graduate Fellowship. Bennett, on the other hand, is resource-poor (an endowment of $9.8 million compared with $214 million at Bryn Mawr) and non-selective in its admissions. However, when compared with other institutions, Bennett has produced the greatest proportion of African American women who earned natural science doctorates. Despite differences in race, ethnicity and socioeconomic status of the two student bodies, the authors found that the eight common characteristics identified below were also evident at Byrn Mawr and Bennett and contributed to the success of these two very different women's colleges in producing high-achieving graduates. Ibid, p. 175

in women's colleges that produce high-achieving graduates.[69] These eight common characteristics include a focused institutional mission, high expectations, focused student support, the presence of role models, a critical mass of high-achieving students, opportunities for extracurricular involvement, inclusion of women in the curriculum, and a recognition of the social realities of women in the real world.[70] Yet, because the case studies are but a snapshot of the institution at the time of the on-site interviews, it is not clear whether these conditions were always in place, and how, if at all, the conditions have changed over time.

Change over time within a framework that examines gendered stratifications is the focus of Margaret W. Rossiter's (1995) *Women Scientists in America*. In fact, Rossiter does not portray the consensus analysis of women's institutions that characterize the work of Tidball and Wolf-Wendell. An historian of science, Rossiter highlights the large number of women who obtained advanced degrees in science before 1970s affirmative action legislation yet remained under-represented, under-served, under-employed and substantially powerless in the profession.[71] Rossiter's analysis, like so many other s, identifies World War II as a defining event in which political rhetoric held out false hope that there would be a place for women in science following the war. Though many

[69] Ibid, p. 140

[70] Ibid, pp. 100-101

[71] Margaret W. Rossiter. *Women scientists in America: Before Affirmative Action, 1940-1972*. Baltimore: Johns Hopkins University Press, 1995.

women made sacrifices and valuable contributions, they could not leverage their capital in the postwar economy.[72] By 1946, the government began a first wave of enrollment restrictions and quotas against women in response to rising pressure for the adjustment of science and engineering in favor of the rightful place of men. "The remasculinization of science in the 1950s and 1960s was underway with a vengeance."[73]

Women's colleges, in an effort to upgrade their rankings and be viewed as top-ranked, "legitimate" institutions, virtually turned their backs on the very population whose education and empowerment were part of their founding missions. Even when women, sparked by the organizing efforts of the Civil Rights movement, began to become vocal about their plight, there were those who simply refused to acknowledge that there was even a problem.

> Having adjusted to it all years before and believing staunchly in individual virtues such as hard work, they were either oblivious to the problem, or, when it was brought to their attention, adamant that it did not exist. They

[72] See, for example, Caroline Herzenberg and Ruth Howes, "Women of the Manhattan Project., *Technology Review* 96.8 (Nov./Dec. 1993): 32-40; and Susan A. Ambrose, et al. *Journeys of Women in Science and Engineering.* Philadelphia: Temple University Press, 1997. The authors note that at least 85 women scientists and engineers were involved in the Manhattan project, which produced the atomic bomb. Included among these women were Lilli Hornig, who helped to develop high-explosive lenses; Leona Woods, whose work with detectors helped to monitor the flux of neutrons from an atomic pile up; and Jean Hinton who helped build the first reactor at Los Alamos.

[73] Rossiter, 1995, p. 33

> were so much a part of the “system” that had treated them comparatively well that it was difficult for them.. .to see a pattern and think of employers and colleagues, even sexists ones, as villains.[74]

The narratives have been instructive to help erode the validity of universalism when examined against the experiences of women (mainly white women) and within specific institutional contexts. Where the literature now abounds with research on women in science, feminist critiques on building a more inclusive science, and ways in which to better connect women’s studies with the science and engineering curriculum,[75] very few studies have examined the intersection of race, gender, and institutional context.

Willie Pearson’s (1985) *Black Scientists, White Society, and Colorless Society* was one of the first sociological studies to examine universalistic principles across time and within the context of race.[76] Gathering information on over 600 Black scientists, Pearson found

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[74] Ibid, p. 381

[75] See, for example, Sue V. Rosser. *Re-engineering Female Friendly Science.* New York: Teachers College Press, 1997 and “Editorial,”*Women’s Quarterly*, 28 (Spring/Summer 2000): 6-11. See also Sue V. Rosser, *Female-friendly Science: Applying Women’s Studies Methods and Theories to Attract Students.* New York: Pergamon Press, c1990; and *Teaching the Majority: Breaking the Gender Barrier in Science, Mathematics and Engineering*. New York: Teachers College Press, c1995; Cinda-Sue Davis, et al. *The Equity Equation: Fostering the Advancement of Women in the Sciences, Mathematics, and Engineering.* San Francisco: Jossey-Bass , c1996.

[76] Willie Pearson, Jr. *Black Scientists, White Society, and Colorless Society: A Study of Universalism in American Science*. Millwood, N.Y.: Associated Faculty Press,

(continued...)

that African Americans earning doctoral degrees in science prior to 1955 found less opportunities to explore their talent than later graduates who, as the benefactors of civil rights agitation and legislation, had wider career opportunities in industry and as faculty at predominately white institutions.

Pearson would later argue that "despite more than a century of participation by Blacks in the professional scientific community, sociologists of science have neglected the study of Black American scientists."[77] John Stanfield (1981) would link this elusivity, if not deliberate silence by scholars, to the reproduction of racialism in society generally.[78] "This neglect is rationalized, usually in brief chapters and lengthy footnotes, by pointing out the statistical rarity of racial minorities in science which makes it unnecessary to study their absence or peripheral participation," but that "American institutions like science are microcosms and reproducers of historically specific society multi-racialism."

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[76](...continued)
1985. Cole and Cole's (1973) *Social Stratification in Science* preceded the Pearson study and assessed universalism within the field of physics. With a specific focus on the use of citations as a criteria for recognition, which later leads to reward and career advancement, the authors found that stratification is based on merit and not particularistic distinctions which characterize stratification in society generally. See Jonathan R. Cole and Stephen Cole. *Social Stratification in Science.* Chicago: University of Chicago Press, 1973. Additionally, well before Pearson and Cole and Cole, there are two volumes that

[77] Willie Pearson, Jr., "The Role of College and Universities in Increasing Black Representing in the Scientific Professions," in Michael T. Nettles (ed.), *Toward Black Undergraduate Student Equality in American Higher Education*. Greenwich, CT: Greenwood, 1988.

[78] John H. Stanfield., "Race in Science." *Contemporary Sociology.* 13, No. 6 (Nov. 1984): 684-685.

By extension, the under-examination of the contributions of historically Black institutions to the scientific enterprise is also unacceptable.

While sociologists have not stepped up their focus, at the institutional level, of organizational structures that produce African Americans in science, there has been an increase in biographies. The eminent historian of science Kenneth Manning's (1983) biography of Ernest Everett Just is, perhaps, one of the most widely-read and striking examinations of the impact of race and institutional context on careers in science.[79] Despite degrees from two prestigious institutions, Dartmouth and the University of Chicago, study under the mentorship of Frank Lillie at the Woods Hole Marine Biological Laboratory, and recognition internationally for his research on egg fertilization and the biology of the cell surface, Just was marginalized in the U.S. and confined to Howard University, an HBCU with limited resources – and willingness – to support Just's research efforts. Linda O McMurray's (1981) biography of George Washington Carver examines the life of this ex-slave who chose to go to the historically Black Tuskegee Institute in 1896. Carver's educational philosophy, however, differed from the industrial focus of Booker T. Washington and Carver was unsuccessful in his efforts to develop a research-based agricultural program.[80]

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[79] Kenneth R. Manning, 1983.

[80] Linda O. McMurry. *George Washington Carver: Scientist and Symbol*. New York: Oxford University Press, 1981.

Wini Warren's (1999) *Black Women Scientists in the United States* attempts to give voice to Black women's experiences.[81] The volume is an expansion of Warren's doctoral dissertation and provides profiles on a wide-range of Black women scientists (including those in the social sciences) during the period between 1900 and 1960. It is an ambitious undertaking and moves attention closer to the experiences and achievements of Black women, particularly those operating at the middle levels and across a broad spectrum of careers. However, there is little historical contextualization and many of the profiles seem little more than curriculum vita in narrative format. We have no point of reference to gauge what it is that we are reading or to place the women's biographies into a larger analysis about the history of women in science. The same holds true for Vivian Ovelton Sammons' (1990) *Blacks in Science and Medicine*.[82]

On the other hand, Susan Ambrose et. al's (1997) *Journeys of Women in Science and Engineering* provides first-person narrative profiles of eighty-eight women scientists, diverse in race, ethnicity, socioeconomic class and career path.[83] The comparisons are striking and are captured within a framework that traces the historical tension between the presence and exclusion of women in science, a tension that informs women's

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[81] Wini M. Warren. *Black Women Scientists in the United States*. Bloomington, IN: Indiana University Press, 1999.

[82] Vivian Ovelton Sammons (ed.). *Blacks in Science and Medicine*. New York: Hemisphere Publishing Corporation, 1990.

[83] Susan A. Ambrose, et. al. *Journeys of Women in Science and Engineering: No Universal Constants.* Philadelphia: Temple University Press, 1997.

contemporary status and relationships. The challenge, however, is that the history assumes homogeneity and says little about the particular history of women of color, not just their individual experiences.

At this conclusion of the writing of this manuscript, Diann Jordan (2006) had just released *Sisters in Science.*[84] A biologist at the historically Black Alabama State University, Jordan provides verbatim interviews with 17 African American female scientists across a range of disciplines, generations, and industry sectors (including two former Spelman College faculty, Shelia McClure and the late Jann Patrice Primus, both in biology.) Jordan's objective was to allow the women to speak for themselves. When questioned about issues of race and gender, many of the interviewees characterized the Civil Rights Movement as significant – even if it didn't directly help to advance their careers in science – but disconnected themselves from what they viewed as the white-women-only-movement. Efforts during the 1970s to gain parity for women in science did not speak to or attempt to include the particular experiences and voices of Black women. Similar to criticisms that characterized early baccalaureate-origin studies and the role and productivity rates of women's institutions (analyzed earlier in this chapter), here, again, the criticism centers on the white woman's experience as universal and lumping black women and other women of color in the category of women without

[84] Diann Jordan. *Sisters in Science: Conversations with Black Women Scientists on Race, Gender and Their Passion for Science.* Indiana: Purdue University Press, 2006.

regard to race, ethnicity, socioeconomic class, and age.[85] The tendency, Jordan argues, leads to a “distorted picture of what is actually true about the black woman’s status in higher education, careers, and society,” and “may often lead to inadequate counseling and resources. . .policy- and decision-making.”[86]

The Jordan study also points to the difficulty in separating out race and gender issues and the reluctance many Black women display in commenting publicly on the topic; instead, opting for race loyalty first and gender second.[87] One interviewee, LaVern Whisenton-Davidson, a biologist at Millersville State University in Philadelphia, responded that “it depends on who is doing the interviewing as to whether or not I think it’s my race or gender at question.”[88] For Black women scientists, Jordan argues that the ultimate cost of not addressing race and gender issues and gender issues within the race seerely limits the

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[85] Ibid, p. 15

[86] Ibid.

[87] As Jordan notes, Black women have not been silent on issues of gender relations within the African American community but have spoken up and out about this topic, as evidenced in Deborah Gray White’s (1999) treatment of Amy Jacques Garvey, wife of the Pan-Africanist Marcus Garvey. Also active in the struggle for the rights of African-descended peoples, Amy Garvey publicly demanded equal opportunity for women in the Universal Negro Improvement Association. Anita Hill’s Congressional testimony in opposition to the Supreme Court nomination of Clarence Thomas, Robin Givens’ television interview exposing spousal abuse by husband and former heavyweight boxing champion Mike Tyson are more recent examples, as is Cole and Sheftall’s *Gender Talk.* See Deborah Gray White. *Too Heavy a Load: Black Women in Defense of Themselves, 1894-1994.* New York: W.W. Norton and Co., 1999.

[88] Jordan, 2006, p. 17

African American female scientist's ability to address concerns that could benefit herself, the science community, and nation.[89]

The 1940s and 1950s:

War, Politics, Policy and the University

The story of Spelman College specifically and the community of historically Black colleges and universities generally is particularly enlightening given the centrality between higher education and the growth of U.S. science. As many scholars have argued, this relationship has its genesis in World War II and military dependence on science to win the war effort.[90] Stuart W. Leslie (1993) points out that the difference between the role of academic science during World War I and World War II was the scale of mobilization and how the money was spent.[91] Universities won contracts for research and development that dwarfed the largest industrial contractors. "At the top of the list, MIT alone was awarded $117 million in R&D contracts, Caltech $83 million, and Harvard and Columbia about $30 million each, compared with just $17 million for

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89 Ibid, p. 19

90 See, for example, Chandra Mukerji, *A Fragile Power: Scientists and the State*, Princeton, N.J.: Princeton University Press, 1989; Bruce L.R. Smith, *American Science Policy Since World War II*. Washington, D.C.: The Brookings Institution, 1990; James H. Capshew and Karen A. Rader, "Big Science: Price to the Present." *OSIRIS* 7 (1992): 3-25; AnnaLee Saxenian, *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*. Cambridge, Mass.: Harvard University Press, 1994.

91 Stuart W. Leslie. *The Cold War and American Science: The Military-Industrial-Academic Complex at MIT and Stanford.* New York: Columbia University Press, 1993.

Western Electric (AT&T), $8 million for GE, and less than $6 million each for RCA, DuPont, and Westinghouse, the top industrial R&D contractors."[92]

Capitalizing on what can be described as science boosterism, the MIT-trained physicist, Vannevar Bush, would argue for a *de facto* public contract for basic science research.[93] Short-term deliverables were undefined, but long-term promises linked public support of science with social and economic prosperity. The public contract would be operationalized through the National Science Foundation, awarding grants and contracts to universities to conduct basic science; and by extension, build their science programs.[94] No other profession had succeeded in pushing through such an open-ended, wide-sweeping policy agenda.[95]

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[92] Ibid, p. 6

[93] Vannevar Bush, 1945. The term *de facto* indicates without formal expression or formal mandate.

[94] Daniel Lee Kleinman, 1995.

[95] It should be noted that Bush was not without his opponents and did not succeed without a fight. Harley Kilgore, a Democrat from West Virginia, also believed that science and technology would be key in a postwar society. Kilgore, however, was concerned by the concentration of power that rested with industrial monopolies that profited from wartime R&D contracts. Kilgore proposed the development of a National Science Foundation that would support basic and applied research to meet national needs – across all disciplines. Bush and Kilgore would propose competing legislation. The compromising bill that ultimately won out retained Bush's focus on public support for basic research, unencumbered by federal involvement and carried out by educational and research institutions. The agency established to meet the need was Kilgore's National Science Foundation, but excluding certain areas of research, including medicine, atomic energy and military concerns. (For a more detailed analysis of Vannevar Bush and the
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Vannevar Bush excited the public imagination and political support for ways in which science *could* improve the quality of life. However, the Cold War and the Soviet launch of Sputnik would be even more influential in mobilizing efforts and appropriating funds to produce the kind of manpower needed for science research and development.[96] When questioned how the Soviets had not only caught up with U.S. technology, but had surpassed it, many pointed to weak science and math programs in U.S. schools.[97] This marked the beginning of a significant expansion in large-scale federal funding of higher education.

The National Defense Education Act (NDEA) of 1958 was the first piece of Cold War legislation designed to strengthen higher education in science and math. The rhetoric of "talent" was prominent in the authorization language.

> The Congress hereby finds and declares that the security of the Nation requires the fullest development of the mental resources and technical skills of its young men and women. We must increase our efforts to

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[95](...continued)
development of science policy during this period, see G. Paschal Zachary., Endless Frontier: Vannevar Bush, Engineer of the American Century. Cambridge: MIT Press, 1999 and Alexander J. Morin. *Science Policy and Politics.* Englewood Cliffs, NJ: Prentice-Hall, 1993.

[96] For a more detailed discussion of the impact of the Soviet Union and Sputnik on U.S. science policy, see Walter A. McDougall. *The Heavens and the Earth: A Political History of the Space Age.* New York: Basic Books, c1985.

[97] Davidson, et. al, 1999

> identify and educate more of the talent of our Nation. This requires programs that will give assurance that no student of ability will be denied an opportunity for higher education because of financial need; will correct as rapidly as possible the existing imbalances in our educational programs which have led to an insufficient proportion of our population educated in science, mathematics, and modern foreign languages and trained in technology.[98]

As we trace this connection between war, politics, and policy, what is not made explicit is that all of higher education did not benefit equally. Kleinman accurately indicates that the public contract was maneuvered by Bush, using his pre-war connections and post-war influence to construct a "dense web of social connections between elite scientists and business and state elites."[99] Fox would characterize these connections as an operant of power, and that grasping these connections is important to understanding science as a focal case in the sociology of gender.[100] I would add that grasping these connections is also important to understanding science as an operant of stratification based on race, gender and institutional setting.

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[98] as quoted in Margaret W. Rossiter, 1995, p. 63

[99] Daniel Lee Kleinman, 1995, p. 20

[100] Mary Frank Fox, 1999, p. 443

For many African American scientists in the pre-*Brown versus Board of Education* period and for some years after, a faculty appointment at an HBCU was the only option. Researchers, such as physicist Edwin R. Russell, worked alongside whites at Los Alamos laboratory and other universities involved with the Manhattan Project.[101] Similar to the experiences of women, after the war the nation seemed to have contracted amnesia about these scientists' contributions and the credibility of their worth. The politics of color took precedence. African American scientists returned to their tradition of working at HBCUs, "barred as they were from holding faculty positions at most white research and teaching institutions."[102] State-sanctioned segregation and discrimination inhibited the development of HBCU science curricula, "just as they have adversely affected every other aspect of Negro American life."[103] HBCUs simply did not have the resources to begin or sustain a program in research or to train students in disciplines that required such resources.

As we know from the limited and sporadic scholarship that is only now beginning to surface on Black women scientists, their experiences have been equally stressful.[104]

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[101] Kenneth R. Manning, "Science and Opportunity." *Science* 282, No. 5391 (Nov.6,1998): 1037-1038

[102] Ibid, p. 1037

[103] Edward K. Weaver, "Development of Science Curricula in Negro Schools," *Journal of Negro Education* 25, No. 2 (Spring, 1956): 118-129.

[104] See, for example, Wini Warren, *Black Women Scientists in the United States*
(continued...)

Gloria Long Anderson, a physical organic chemist, did her undergraduate work at Arkansas A&M Normal College because "it was the only Black state school; it was close to home; and it was almost affordable."[105] After completing the doctoral degree at the University of Chicago in 1968, Long made the conscious decision to pursue her career at a historically Black institution, Morris Brown College in Atlanta, Georgia. Long writes, "my friends told me – and those were my *Black* friends, not white ones – that to do so was to commit professional suicide."[106] Anderson would later acknowledge the importance of institutional environment and that her research on synthetic antiviral agents would probably have been easier to sustain at a large, mainstream university. "You see, as a scientist at a predominantly white college you can get everything you need to do your research; at a Black college you can't. . .I have not been able to do the research here that I could have done at a white university."[107]

1960s and 1970s:

Civil Rights, Feminist Mobilization and 'Universalism' in Question

If the 1940s and 1950s were characterized by science boosterism, then the 1960s and 1970s exposed a crisis in the public image of science. At issue were questions of human

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[104](...continued)
(Bloomington: Indiana Univ. Press, 1999); and Susan A. Ambrose, 1997.

[105] As quoted in Wini Warren, 1999, p. 3

[106] Ibid, p. 1

[107] Ibid, pp. 1-2

rights, equal rights, and the use of science to promote a more just and democratic society.[108] Anti-war activists appealed to the public's moral sensibility and staged campus protests regarding the use of Agent Orange and Napalm bombs, both products of science, on innocent women and children in Vietnam. Rachel Carson's *Silent Spring* sounded the alarm about the harmful effects of the pesticide DDT on the environment.[109] The article precipitated a larger debate on science regulatory controls, social responsibility and public participation in science policy formulation and establishing research agendas.[110] The links that tied scientific research with promises of economic and social benefit under the *de facto* public contract now proved to be obscure at best, if not overstated and inflated from the start.

The majority of literature in African American studies about this period has focused on the struggle by Blacks, and liberal sympathizers, to end segregation and gain political and economic parity. Little has been written about the political consciousness of African

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[108] James West Davidson, et. al. *Nation of Nations: A Concise Narrative of the American Republic, Volume Two: Since 1865*, Boston: McGraw Hill, 1999.

[109] Rachel Carson. *Silent Spring*. Boston: Houghton Mifflin, 1962.

[110] For an expanded discussion regarding misconduct in science and the move for greater public participation, see William Broad and Nicholas Wade. *Betrayers of the Truth*. New York: Simon and Schuster, [1983] c1982; David Dickson and David Noble, "Antidemocratic Science: The New Corporate Technocrats," *The Nation*, 233, No. 193 (1981): 208-212; Richard Sclove. *Democracy and Technology.* New York: Guilford Press, c1995; and Steven Epstein. *Impure Science : AIDS, Activism, and The Politics of Knowledge.* Berkeley: University of California Press, c1996.

American scientists. Historian of science Kenneth Manning notes that African American scientists had to reconcile their career goals against their commitment to community and broader issues of civil rights and social justice.

> It was sometimes difficult for them to explore Banach spaces in mathematics classes or repeat Arrhenius's experiments on the conductivity of electrolytic solutions in the chemistry lab while demonstrations against Dow Chemical Co., the Vietnam War, and the killing of black students at Jackson State proceeded apace.[111]

Public perceptions and criticisms about the uses of science and the seemingly unchecked balances of its power were compounded by concerns about *who* got to participate in the scientific enterprise, the *nature* of that participation, and the *equitable* distribution of public resources. These concerns directly challenged any argument that science was universalistic in its reward and recognition of talent and in the distribution of resources.

We know that federal support for university research changed considerably immediately following the end of World War II. Alexander Morin (1993) shows that the share of academic research grew from 14 percent in 1953 to 27 percent in 1989.[112] When broken

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[111] Kenneth R. Manning, 1998, pp. 5-6

[112] Alexander J. Morin, 1993.

(continued...)

down by institutions, a total of 40 institutions received $5 million or more in federal funds. By 1989, the number receiving an equivalent amount had risen to 95.[113] Morin argues that those institutions receiving the top levels of support in 1989 are the same institutions who received the top level of support at the turn of the century is not the result of favoritism in "any simple sense."[114] The statement, however, does not analyze or even acknowledge the historical factors which provide the basis for why these certain institutions remain on top; or, why others, are not able to compete.

This unequal distribution of resources did not go un-noticed. Pressure brought on by the civil rights activists had succeeded in pushing through the Civil Rights Act of 1964 which said that "no person in the United States shall, on the ground of race, color or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance."[115] While this historic legislation opened up the doors for African Americans to attend mainstream, predominately white institutions, further grass-roots mobilizing and legislative intervention, including Title III of the Higher Education Act of 1965,

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[112](...continued)

[113] Ibid, p. 100

[114] Ibid, p. 98

[115] See Title VI of the Civil Rights Act of 1964, 42 U.S.C. 200d. Under Title VI, equal protection principles extended to private institutions that accept federal financial assistance.

made specific adjustments to strengthen the capacities of HBCUs. By 1966, the National Science Foundation, the National Institutes of Health and the U.S. Department of Defense had all launched programs to support "developing' universities that could not easily qualify for project grants based on peer review.[116]

Women, energized and adopting the rhetoric and strategies of Civil Rights activists, openly questioned the low percentage of female scientists entering and advancing in the profession. They framed their arguments in terms of discrimination, equality and access. In her widely publicized 1965 article, "Women in Science: Why So Few?," the sociologist Alice Rossi openly criticized science institutions for a pattern that revealed fewer women in science at every successive level, and indicted society as a whole.[117] "Everyone expected them to drop out," writes Rossi, "felt more comfortable when they did, and even planned for it."[118] Later that year, Ruth Kundsin, a research associate in bacteriology, published an equally critical indictment of the profession. Kundsin claimed that women in science were not acclaimed for their achievements but were singled as oddities and resented by other women. "It would take changes in behavior as well as

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[116] Bruce L.R. Smith, 1990, p. 75

[117] See Alice S. Rossi, "Women in Science: Why so Few?", *Science*, 148 (1965): 1196-1202; see also Alice S. Rossi, "Barriers to the Career Choice of Engineering, Medicine or Science among American Women," in Mattfeld and Van Aken (eds.). *Women and the Scientific Professions*, Cambridge: MIT Press, 1965.

[118] Margaret W. Rossiter, 1995, p. 367

laws for women to be fully accepted as scientists."[119] Even Executive Order 11375, signed by President Johnson in 1967 to ban racial and sexual discrimination by federal contractors, and tested by the clinical psychologist Bernice Sandler in a class-action lawsuit against the 250 colleges and universities comprising the University of Maryland, and the State University of New York, City University of New York, and University of California systems, did little to change institutional patterns of sexually discriminatory behavior.[120] It would take another five years to enact change through the Equal Employment Opportunity Act of 1972 and the Education Amendments Act of that same year. Enacted under President Nixon, the Equal Employment Act of 1972 succeeded in dropping that portion of Title VII that exempted all educational institutions from equal employment opportunity laws.[121] The Educational Amendments Act included a Title IX provision which extended the Equal Pay Act of 1963 to higher education and banned sex discrimination in any program of an institution receiving federal funding.[122]

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[119] Ibid, p. 368

[120] Ibid, p. 375.

[121] Ibid, p. 376

[122] Public Law 92-318, *U.S. Statutes at Large* 86 (1972); 373-75; and *Higher Education Amendments of 1971: Hearings before the Subcommittee on Education of the Committee on education and Labor, House of Representatives, 92nd Congress, 1st Session* (Washington, D.C.: GPO, 1971), as cited in Margaret W. Rossiter, 1995, p. 362. It is also worthy to note that Title IX of the Higher Education Amendments were expanded to include recommendations as outlined by the U.S. Commission on Civil Rights in 2000 and the Government Accountability Office (GAO) in 2004 to specifically focus on the participation of girls in STEM. In 2004, the GAO issued the report, "GENDER ISSUES: Women's Participation in the Sciences Has Increased, but Agencies Need to Do More to
(continued...)

Rossiter (1995) provides one of the most detailed accounts of feminist mobilization during the 1960s and early 1970s to push for legislative reform to combat what was identified as structural problems that limited women's access to and advancement in the profession.[123] The Rossiter narrative points to sustained patterns of discrimination that accounted for the invisibility of women, mainly white women, in science prior to efforts to achieve parity, resulting in the affirmative action legislation of the 1970s.[124] The Rossiter narrative is less probative about the experiences of Black or other women scientists of color and efforts by these groups to increase their representation in science and achieve parity.

Shirley Malcom (1993) notes that Black women and other women of color were not silent during the 1970s period of feminist mobilization but "found little that spoke specifically to their particular needs."[125] This perception of the incongruence of interests and needs punctuates a larger divide that historically has existed between white and Black women feminists in the struggle for political and economic parity. Unfortunately,

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[122](...continued)
Ensure Compliance with Title IX." (See http://www.gao.gov/htext/d04639.html) [Accessed: 09 July 2006]

[123] Margaret W. Rossiter, 1995

[124] Ibid.

[125] Shirley Malcom, "Increasing the Participation of Black Women in Science and Technology," in Sandra Harding (ed.) *The 'Racial' Economy of Science: Toward a Democratic Future*. Bloomington and Indianapolis: Indiana University Press, 1993.

as Cole and Guy-Sheftall (2003) argue, the under-examination, and even the conscious erasure of the roles and contributions of Black women and other women of color within scholarly and popular media, "perpetuates the myth that we were absent from the development of contemporary feminism rather than being critical to its formulations."[126]

Black women scientists sought to raise awareness about their experiences, increase access and ensure parity. Jewel Plummer Cobb, an early Black female pioneer in science who earned the doctoral degree in physiology from New York University in 1950 and became president of California State University at Fullerton in 1981, sought change. Cobb worked with the American Association for the Advancement of Science to organize a conference specifically focused on the needs of minority women in science and engineering and exploring how those needs differed from the needs of all women and those of minority males. The resulting conference proceedings, *The Double Bind: The*

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[126], Johnnetta B. Cole and Beverly Guy-Sheftall. *Gender Talk: The Struggle for Women's Equality in African American Communities.* New York: Ballantine, 2003. For a larger discussion about the roles and contributions of Black women to feminism and organizing for women's rights see bell hooks. *Ain't I a Woman: Black Women and Feminism*. Boston: South End Press, 1981; Patricia Hill Collins. *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment.* New York: Routledge, 2000; *Fightin' Words: Black Women and the search for Justice.* Minneapolis: University of Minnesota Press, 1998); and *Still Lifting, Still Climbing; African American Women's Contemporary Activism*. New York: New York Univ. Press, 1999; Beverly Guy-Sheftall (ed.). *Words of Fire: An Anthology of African American Feminist Thought.* New York: New Press, 1995 and "Other Mothers of Women's Studies," in Florence Howe, (ed.). *The Politics of Women's Studies: Testimony from Thirty Founding Mothers*. New York: Feminist Press, 2000; Sheila Radford-Hill. *Further to Fly: Black Women and the Politics of Empowerment*. Minneapolis: Univ. of Minnestoa press, 2000.

Price of Being a Minority Woman in Science, increased visibility of issues that minority women uniquely face. "The more an individual resembles the 'typical scientist' the lower are his costs. But for women of color, "their differentness" came at great personal sacrifice. "The scarcity of companions of their own racial or ethnic group and gender, progressively greater as the degree of specialization in science increased, was a source of isolation and loneliness."[127]

The 1980s and 1990s:
Global Economic Competitiveness, a Pipeline and a National Reform Movement

By the 1980s, the Cold War rhetoric of national defense was coupled with the catchphrase "global competitiveness." Labor forecasters were predicting that shortages in science, mathematics and engineering doctorate holders would start in the late 1990s and last until the year 2020. Japan was now the major cause of concern and Ronald Reagan's supply-side economics focused on the notion of a "pipeline" to monitor and increase the supply.

Juan Lucena (2005) traces the origins of the pipeline to the 1980s and the quest for certified knowledge by the National Science Foundation.[128] The newly installed

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[127] Shirley Malcom, 1993, p. 251

[128] Juan Lucena. *Defending the Nation: Policymaking in U.S. Science and Engineering Education from Sputnik to the War Against Terrorism.* Lanham, MD: University Press of America, 2005a. While Lucena argues that the pipeline can be traced

(continued...)

administration of Ronald Reagan talked of supply-side economics and the need for "certified knowledge" of the kind of manpower needed to meet the supply. In 1983, Reagan's Commission on Excellence in Education released the report *A Nation at Risk,* which spoke to the U.S.'s threatened economic position in the global economy and the challenge to what was once preeminence in science and technology. The report used the language of educational reform and both pre-college and undergraduate education were acceptable areas for federal government involvement. By signing the "Education for Economic Security Act of 1984 into law, Reagan again made the connection between education and national security, though the security in this instance was of an economic nature. And rather than simply indicating a need for training more scientists, the focus was on "certified knowledge" to project numbers that would inform manpower needs and reform in education to promote a change in science and math instruction.

The late Alan Fechter, a policy analyst at NSF who later became Director of the Office of Scientific and Engineering Personnel at the National Research Council, echoed the need for a new model that would enable the government to make policy based on "what we want to see 10 and 15 years from now in terms of what is coming out of the *pipeline* with respect to science and engineering. Betty Vetter, Executive Director of the Scientific

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[128](...continued)
to the 1980s, intellectual remnants of its origins can be traced to Zuckerman and Cole's (1975) notion of successive filtering. The two argued that at each stage of education, the percentage of women, as well as minorities, steadily decreases so that their participation in is below parity. See Harriet Zuckerman and Jonathan Cole, "Women in American Science," in *Minerva.* 13 (1988): 82-102.

Manpower Commission (now the Commission on Professionals in Science and Technology), again picked up this language of the pipeline and focused on populations that had been under-utilized; namely women and minorities. Lucena notes, "Instead of acknowledging women and minorities for their contributions to solve domestic problems as it happened in the 1970's, experts began to recognize the potential numerical contributions of both women and minorities to manpower for competitiveness."[129]

More recently, scholars, policy analysts, and politicians have revisited the question of national shortages within the professional scientific workforce.[130] In 1999, white males comprised 64 percent of U.S. scientists and engineers.[131] By contrast, African Americans comprised only three percent of the STEM workforce for the same period. U.S. Census projections, however, indicated a marked decrease of white males as part of the STEM workforce to twenty-six percent by the year 2050, due, in large part, to those who are at or near to retirement age.[132]

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[129] Juan Lucena, 2005, p. 39

[130] see Alan Fechter, "Future Supply and Demand: Cloudy Crystal Balls," in W. Pearson, Jr. and A. Fechter (eds.) *Who Will do Science? Educating the Next Generation*. Baltimore, MD: Johns Hopkins University Press, 1994.

[131] Shirley M. Malcom, Daryl E. Chubin, Jolene K. Jesse, (eds.). *Standing Our Ground: A Guidebook for STEM Educators in the Post-Michigan Era*. Washington, D.C.: American Association for the Advancement of Science and the National Action Council for Minorities in Engineering, October 2004.

[132] Ibid.

Pressures internally are compounded by competition internationally. Shirley Ann Jackson (2004), president of the Renssalear Polytechnic Institute and the first African American woman to earn a doctorate from MIT, points to the growth by other countries to increase their STEM education programs.[133] India secured a $250 million loan from the World bank to revamp that country's engineering colleges. Since 1975, countries in Asia – China, Japan, South Korea and Taiwan – have doubled their baccalaureate degree production in the natural sciences and quadrupled the number of undergraduate degrees awarded in engineering.[134]

Few would argue that the pool from which the U.S. recruits its scientific talent needs to be expanded to more adequately reflect the nation's changing demographics. However, the political rhetoric of pipeline as metaphor and method is problematic. While the term has focused attention on the under-representation of racial minorities and women in science, its politically-motivated framework prevents a full analysis of why such patterns of under-representation and under-utilization exist. The late Alan Fechter (2000) argued that longitudinal data can be helpful in documenting the flow in and out of science and

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[133] Shirley Ann Jackson, "The Beauty of Diverse Talent," in Shirley M. Malcom, Daryl E. Chubin, Jolene K. Jesse, (eds.). *Standing Our Ground: A Guidebook for STEM Educators in the Post-Michigan Era*. Washington, D.C.: American Association for the Advancement of Science and the National Action Council for Minorities in Engineering, October 2004.

[134] Ibid.

determining where in the educational system the net losses are concentrated.[135] He further noted that, “flow data, while necessary, do not provide sufficient information for formulating policy. One also needs to know what motivates the flows, and this requires and understanding of behavior.”[136] By behavior, Fechter was referring to individual behavior. Changes to individual behavior are important, but they must be complemented by a model that links an analysis of individual behavior with broader, systemic factors connected to political and economic influences.

However, even if one were to accept the notion of an educational pipeline as it is currently constructed, it is curious why no study has sought to place within a historical framework, that moves beyond statistical data, the role of historically Black colleges and universities and how these institutions have helped to fuel the pipeline with human resources.

Pearson and Pearson (1985) called for such an examination to further explore “the undergraduate institutions that have been most successful in producing Black scientists but also on the scholars under whom the Black scientists pursued their undergraduate

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[135] Alan Fechter, “Policy Issues.” In George Campbell, Jr. et. al. (eds.) *Access Denied: Race, Ethnicity, and the Scientific Enterprise*. New York: Oxford University Press, 2000.

[136] Ibid, p. 45

training."[137] Later Leggon and Pearson (1997) would call for a systematic study of scientific education at HBCUs, beyond statistical collections of degree recipients and enrollees.[138] The two indicated a need for an analysis of the practice and teaching of science and engineering at HBCUs that could inform and enhance science education programs nationwide. Four years later, the American Association for the Advancement of Science (AAAS) would identify the same gap in the literature.[139] The AAAS called for improved research methodologies that take into account all *actors* in the system; establish universal standards for data collection that might encourage collaboration and cross-comparison of findings; and expand foci to include factors that not only limit progress but those that facilitate success. [140] Among those factors that had already been proven successful in facilitating progress included pre-college recruitment initiatives,

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[137] Willie Pearson, Jr. and LaRue C. Pearson, "Baccalaureate Origins of Black American Scientists: A Cohort Analysis," *Journal of Negro Education*. 54, No. 1 (Winter, 1985): 24-34.

[138] Cheryl B. Leggon and Willie Pearson, Jr., "The Baccalaureate Origins of African American Female Ph.D. Scientists," *Journal of Women and Minorities in Science and Engineering.* Vol. 3 (1997): 213-224.

[139] see Yolanda S. George, et. al. *In Pursuit of a Diverse Science, Technology, Engineering and Mathematics Workforce: Recommended Research Priorities to Enhance Participation by Underrepresented Minorities.* Washington, D.C.: American Association for the Advancement of Science, December 2001 (under NSF Grant Number HRD 9817536, A002). It should be noted that Willie Pearson, Jr. was one of the 70 scholars and educators invited by AAAS to form the study group to examine and identify the research priorities.

[140] American Association for the Advancement of Science. *In Pursuit of a Diverse Science, Technology, Engineering and Mathematics Workforce*. Washington, D.C.: AAAS, 2001. (NSF Grant No. HRD-9817536, A002)

post-secondary academic support programs, financial aid, bridge programs from high school to college to graduate school, mentoring, and institutional environments that nurture student development, and acknowledge and value the perspectives that such groups bring to the discipline.

In spite of these projections, institutions of higher education have a dismal record of producing qualified scientists, mathematicians, and engineers representative of these groups. When the data is compiled, emphasis is placed on gathering information on the success rates of institutions whose brands saturate the higher education market and who have benefitted from science-friendly policies since the 1940s. These institutions include, amongst others, the Massachusetts Institute of Technology, Harvard, Yale, the University of California at Berkeley, and Stanford. Rarely are the more than 100 historically Black colleges and universities included in the samples.

In their 1996 publication, *The Equity Equation*, Cinda-Sue Davis, et al. revisit the past decade of efforts designed to remove barriers and foster the participation of women in STEM undergraduate and graduate study and professional careers.[141] Astin and Sax particularly focused on interventions to develop scientific talent. The two selected five institutions that, arguably, evidenced "strong positive effects. . .on attracting and

[141] Cinda-Sue Davis, et. al., 1996.

retaining women and students of color in the sciences."[142] The schools selected included Johns Hopkins University, Case Western Reserve University, Albion College, Santa Clara University and the Georgia Institute of Technology. In explaining their selections, Astin and Sax noted that "other institutions did exhibit positive effects, but these five were chosen for closer study because, as a group, they represent a *cross-section* [my emphasis] of higher education."[143] By this very statement, it would seem that HBCUs are non-entities. Fortunately, the 1998 publication of the Wolf-Wendel study, which dis-aggregated by race and gender highly productive institutions graduating women in STEM who earn the doctorate, helped to remove HBCUs from the blanket of women's colleges which had previously masked the significant role HBCUs and other minority-serving institutions play with respect to access for African American women. While Spelman College and other HBCUs emerged prominently on the Wolf-Wendel list, this information had already been documented by James M. Jay in 1971, by Pearson in the 1980s, and in the published findings of Leggon and Pearson published a year prior.[144].

Chapter Conclusion

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[142] Helen S. Astin and Linda J. Sax. In Cinda-Sue Davis, et. al. *The Equity Equation: fostering the Advancement of Women in the Sciences, Mathematics and Engineering.* San Francisco: Jossey-Bass, 1996, p. 111.

[143] Ibid, p. 111.

[144] See James M. Jay, *Negroes in Science: Natural Science Doctorates, 1876-1969.* Detroit, Michigan: Balamp Publishing, 1971; and Leggon and Pearson, "The Baccalaureate Origins of African American Female Ph.D. Scientists" *Journal of Women and Minorities in Science and Engineering* 3 (1997): 213-224.

World War II proved to be a turning point in elevating the role of science in the public consciousness. The advent of war also cemented the institutional connections between science, higher education and government. Universities needed federal dollars to help build their departments, programs and the overall science infrastructure, while the government needed universities to produce the "talent" necessary to shore up national defense, increase global economic competitiveness and otherwise feed the "pipeline." Robert Merton captured the mores of the community with his thesis of a normative structure. Universalism, he argued, ensured that scientists be judged on merit and that careers be open to talent.

In his sociohistorical overview of Blacks in science, Bechtel convincingly argues that past policies, coupled with societal attitudes and behaviors, influenced the practice of science and set the stage for the current status of African Americans in science.[145] analysis extends to the institutions designed to provide Blacks with educational access.

Feminists and scholars of women's studies have challenged the ideal of universalism. These scholars have shown that science, as a medium of power, reflects and reinforces gendered stratification. More broadly, the equation that recognition follows merit and career attainment follows talent stands in stark contradiction to a nation that has historically battled over equality, equity and access to redress policies that excluded large

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[145] H. Kenneth Bechtel, 1989

segments of the population from participating fully in the scientific enterprise. Mary Frank Fox, perhaps, articulated the contradict best, noting that "women have long been in science, but not central to science, in significant or influential roles."[146]

Within the narrative of the history of U.S. science, there is a group of special-focus institutions whose efforts and experiences in contributing to the development of the human resources needed to sustain the scientific enterprise have been conspicuously absent. We now know from the sprinkling of biographies of African American scientists that many, particularly those obtaining advanced degrees before 1954, were nurtured on the campuses of historically Black colleges and universities. What is less clear is the experiences of Black women at these institutions, as well as in higher education generally.

Wolf-Wendel's 1998 study provided further insight and complemented the findings of Leggon and Pearson a year earlier and the seminal work of James M. Jay in 1971. Wolf-Wendel documented the unique, almost exclusive purview of HBCUs in producing Black women in science and the significant role of Hispanic-serving colleges for Latinas. Further refinements in research methods would be captured by Tidball I 1999 with the use of qualitative case studies to explore institutional priorities, patterns and principles that have been developed and applied at women's colleges that might inform other efforts

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[146] Fox, 1999, p. 441

to improve women’s educational experiences. Yet, because the case studies were only snapshots of the institution at the time of the on-site interviews, the research was less instructive whether the conditions for productivity were always in place, and how, if at all, the conditions have changed over time.

The research that follows attempts to fill a gap in the literature, using Spelman as an example to explore the unique characteristics of HBCUs which have influenced (or inhibited) productivity. Spelman is one of more than 100 historically Black colleges and universities, spread across 18 states, the District of Columbia, and the U.S. Virgin Islands. Across from Spelman at Morehouse College, a liberal arts college for Black men, Cecil Ransom McBay, whose work with compounds proved useful in the production of artificial hormones, spent 36 years nurturing the development of male and female chemists. In Virginia, Hampton Institute (now known as Hampton University) would reinvent itself from a normal college, providing grade-level education and practical technical training to students who would become laborers and blue-collar workers, to one of the top physics programs in the country. Florida A&M University, ranked in 1997 by *Time* magazine as the top institution in the country, has managed to maneuver the politics of state support to sustain science programs that continue to rank among the top in the nation.

Despite constraints, the contributions that Spelman and other productive HBCUs have made to the U.S. scientific workforce have been enormous. Their legacies and documented patterns of student development and degree productivity speak to a shift in how the nation defines, classifies and ranks "top" universities and how policy officials make decisions and allocate resources. Further, the educational strategies developed at these institutions provide model practices for the U.S. higher education system which continues to struggle with attracting, retaining and successfully graduating students who emerge as the next generation of scientists, mathematicians, and engineers.

The research is also significant on a larger level. Embedded in the institutional history of Spelman are unexplored narratives regarding race, gender and the South; religion, philanthropy, higher education and public policy; and individual biographies of Black women who aspired to achieve. Each of these narratives is mediated by education – a medium that has played a particular role in the Black experience in America, in women's experiences, in regional differences, and in the production of science and technology knowledge bases that continue to create wealth and power that transcend national boundaries. What new perspectives might an examination of these institutions, and Spelman College in particular, add to our conceptualization of the history of U.S. science and technology? Conversely, what message might we infer from their continued absence in the literature?

CHAPTER 3

HBCUs and SCIENCE EDUCATION:

AT THE FRINGES

> Despite our concern over the national shortage of scientists and science teachers, one reservoir of manpower continues to be excluded from many areas of full participation in American life. . .The 16 million Negro people. . .Patterns of segregation and discrimination have adversely affected development of science education programs at all levels of educational training, just as they have affected every other aspect of Negro American life. The South, handicapped as it is by a relatively lower income and higher educational load than the rest of the nation, has failed to develop an adequate program for the training of scientists and science teachers for either its Negro or white citizens.[147]
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> Edward K. Weaver (1956), "Development of Science Curricula in Negro Schools"

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[147] Edward K. Weaver, "Development of Science Curricula in Negro Schools," *Journal of Negro Education*, vol. 25, no. 2 (Spring, 1956) pp. 128-29

Post-WWII and Federal Support of

University Science Research and Education

World War II marked the beginning of a significant expansion in the scale and scope of federal funding of university science research.[148] The rhetoric undergirding Vannevar Bush's *de facto* public contract shaped public perception and influenced federal policies about the role science would play in the emerging society – through job creation, higher wages, shorter work hours and more time for leisure.[149] In short, in addition to continuing to develop military technologies to protect the nation from foreign threats, science would be the source of widespread social change.

Later, the beginnings of Cold War tensions in 1945 and the Soviet's initial launch of the *Sputnik* satellite in 1957 would be even more influential in mobilizing efforts and appropriating funds to produce the kind of manpower needed for science research and development.[150] Congress found that an educational emergency existed, and the National Defense Education Act (NDEA) of 1958 was the first piece of Cold War legislation

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[148] See Alexander J. Morin, *Science Policy and Politics*, Englewood Cliffs, NJ: Prentice-Hall, 1993.

[149] Vannevar Bush, *Science, the Endless Frontier: A Report to the President on a Program for Postwar Scientific Research*, Washington: National Science Foundation, 1980.

[150] For a more detailed discussion of the impact of the Soviet Union and Sputnik on U.S. science policy, see Walter A. McDougall, *The heavens and the earth : a political history of the space age*, New York: Basic Books, 1985.

designed to strengthen higher education in science and mathematics.[151] For the fiscal years 1959-1962, Congress appropriated $887 million to fund the nine programmatic provisions of the NDEA, including a student loan program, an institutional aid program, and graduate fellowships.[152]

Even when the social upheavals of the 1960s and early 1970s produced a counterculture of activists who focused public attention on scientific misconduct and demanded greater accountability and access, public protests did little to diminish the billions of dollars being appropriated to support science and the need to increase the supply of scientists, mathematicians and engineers.[153] Federal support for research increased from

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[151] Public Law 85-864, 85th Congress, 2d session (Sept. 2, 1958), National Defense Education Act of 1958.

[152] Ibid. While most attention to the NDEA of 1958 has focused on the provisions to improve science and mathematics, the Act also focused on language instruction as well. The ten specific provisions of the NDEA included: (1) loans to students; (2) allotments to states and loans to private schools to strengthen science, mathematics, and modern foreign language instruction; (3) three-year graduate fellowships (especially for students interested in becoming college teachers); (4) allotments to states for counseling and testing to identify and encourage able students in the target disciplines; (5) university-based research for language and area studies; (6) research and experimentation with new educational media; (7) vocational education; (8) transfer of the Science Information Service to the NSF; and (9) a miscellaneous provision requiring all those supported to take a loyalty oath to the United States.

[153] The intellectual origins of this “antiscience movement” are varied, ranging from protests against the use of Napalm bombs against innocent civilians during the Vietnam War, to the rise of environmentalists who tracked the impact of industrial expansion on air quality, water quality and human health. One of the most widely cited volumes is Rachel Carson, *Silent Spring*, Boston: Houghton Mifflin, 1962. Carson, a marine biologist, sounded the alarm relative to the harmful effects of the pesticide DDT (continued...)

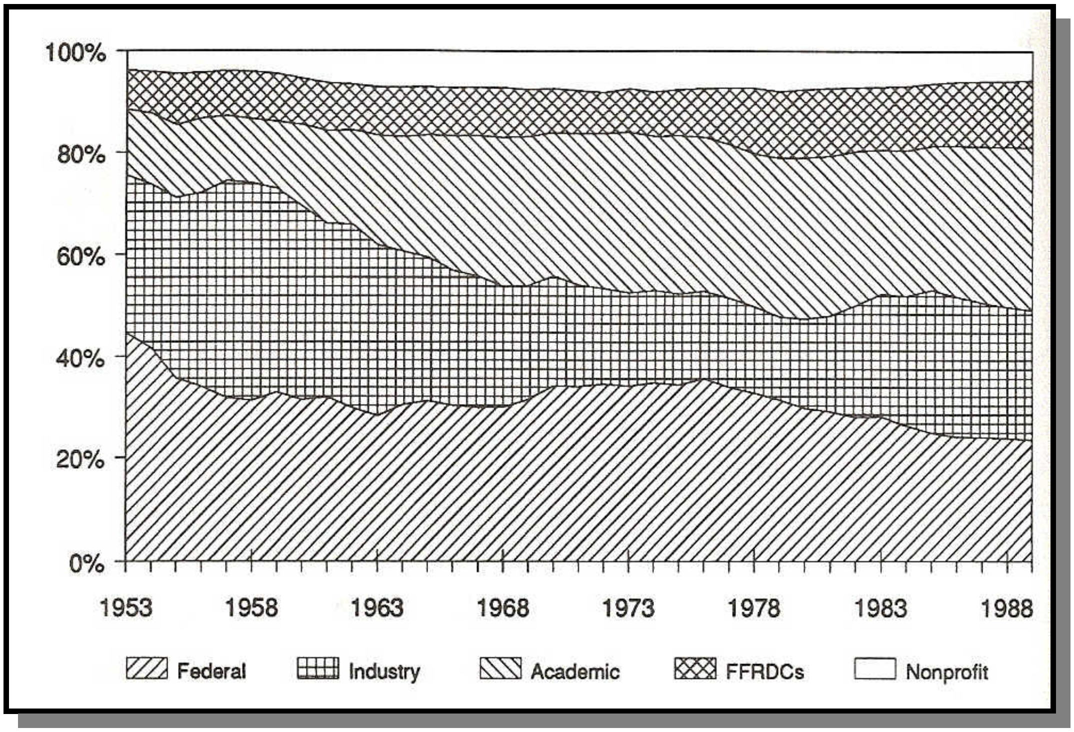

Figure 3.1 Federal Support for Research by Sector, Percentages, 1953-1989
Source: Alexander J. Morin, *Science Policy and Politics*, Englewood Cliffs, NJ: Prentice-Hall, 1993, 36

approximately $2.8 billion in 1953 to $61 billion in 1989.[154] Figure 3.1 shows that academic institutions represented the largest sector increase, "growing uninterruptedly from 13 percent of the total in 1953 to 32 percent in 1989."[155]

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[153](...continued)
on the environment. For an expanded discussion regarding misconduct in science, see William Broad and Nicholas Wade, *Betrayers of the Truth*, New York: Simon and Schuster, 1982.

[154] Morin, 1993, p. 32

[155] Ibid, pp. 35-36

For the purposes of this study, the pattern of allocations show a disconnect between what was identified as the source of the problem (a poor educational system) and the flow of federal dollars (research). Government officials acknowledged a need to increase the supply of trained scientists, but the majority of funds were going to support research *not* education programs. Even when one adjusts for the recognition that research is a much more expensive enterprise than instruction, the disparity between the expenditures is enormous. The $887 million allocated to support the first four years (1959-1962) of the NDEA does not equal a single year of research expenditures, beginning with 1953 when NSF began to track this data. Further, because of this focus on research, only certain kinds of institutions would benefit. Those that benefitted were the ones with the infrastructure to engage in research, and not necessarily those with graduate programs. Even the women's institutions who, by now, had worked to create a culture to support science and had endowments to build science programs, were securing funds. By the late 1980's, federal support was concentrated among less than 700 – or 23 percent -- of the more than 3,000 colleges and universities in the United States.[156] Of this group of 700, the top tier of 100 received more than 80 percent of all federal research funds flowing to colleges and universities. As we examine the figures even further in Table 3.1, the top 50 received over 60 percent of all federal funds, averaging $100 million each. Of the top institutions receiving support, not one was a historically Black college or university.

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[156] Morin, 1993

The Mertonian normative structure would argue that the rise of this “top tier” of institutions, and others like them, is consistent with the ethos of universalism and the proposition that recognition and reward is based on merit. That, in fact, is the underlying premise of the grant peer review system. Arguments questioning its legitimacy have long been the source of debate. Bruce L.R. Smith (1990), a former policy analyst with Washington D.C.-based think tank, the Brookings Institution, characterized complaints as acrimonious, noting that “strains surfaced between faculty and administration, public and private universities, and investigators who retained and those who lost grants, not because the system failed to work but because it worked exactly as intended.”[157]

[157] Bruce L.R. Smith, *American Science Policy Since World War II,* Washington, D.C.: The Brookings Institutions, 1990

Table 3.1
Federal Support for Academic Research and Development by Institution, 1988

Rank	Institution	$ 000
1	Stanford University	239,847
2	Johns Hopkins University	214,979
3	Massachusetts Institute of Technology	207,157
4	University of Washington	203,691
5	University of California at Los Angeles	170,839
6	University of Michigan	167,865
7	University of California at San Diego	166,501
8	University of California at San Francisco	159,027
9	University of Wisconsin	150,474
10	Columbia University	150,263
	Total First 10 Institutions	1,830,643
	Total First 25 Institutions	3,581,385
	Total First 50 Institutions	5,266,999
	Total First 100 Institutions	7,036,613

Source: Alexander J. Morin. *Science Policy and Politics.* Englewod Cliffs, NJ: Prentice Hall, 1993.

Such an analysis fails to place these institutions within an historical context that takes into account factors that may create advantage for some and disadvantage for others.[158]

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[158] See, for example, Stuart Leslie's 1993 *The Cold War and American Science,*
(continued...)

HBCUs:

A System of Separate and Unequal Education Based on Race

Historically Black colleges and universities emerged from a legacy of slavery and federal legislation that condoned separation based on race. Clustered primarily in the South, historically Black colleges and universities were established to provide educational access to African Americans during a period in U.S. history when segregationist policies closed doors at mainstream institutions.[159] Even if admission had been open for Blacks

[158](...continued)
which analyzes the growth of the Massachusetts Institute of Technology (MIT) and Stanford University. With the help of influential alumni such as Vannevar Bush, Leslie argues that MIT emerged from the war as the country's largest university defense contractor, consolidated its lead in the postwar years, and has never been seriously challenged since. Stanford University, who Leslie describes as "a bench warmer during World War II," followed the MIT model to "propel itself from a respected regional university into a science and engineering all-star." Stuart W. Leslie, *The Cold War and American Science*, New York: Columbia University Press, 1993. See, also, AnnaLee Saxenian, *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, Cambridge, Mass.: Harvard University Press, 1994, and John W. Servos, "Engineers, Businessmen, and the Academy: The Beginnings of Sponsored Research at the University of Michigan, *Technology and Culture*.

[159] The phrase "historically Black college and university" has a very particular meaning and was first introduced in The Higher Education Act of 1965. The Act, as amended, defines an historically Black College or university as: "...any historically Black college or university that was established prior to 1964, whose principal mission was, and is, the education of Black Americans, and that is accredited by a nationally recognized accrediting agency or association determined by the Secretary [of Education] to be a reliable authority as to the quality of training offered or is, according to such an agency or association, making reasonable progress toward accreditation." In 1981, President Reagan, under Executive Order 12320, established the White House Initiative on Historically Black Colleges and Universities, which set into motion a government-wide effort to strengthen HBCUs. (see http://www.ed.gov/about/inits/list/whhbcu/edlite-index.html) [Accessed: 10 March 2006]. For an expanded discussion of the history of the education of African Americans in the U.S., see H. Kenneth Bechtel, "Introduction,"
(continued...)

to pursue higher education, in the mid-nineteenth century, less than five percent of African Americans out of a population of 4.5 million could read and write.[160] The former slaves sought to uplift themselves through education. So, with the help of missionaries, religious aid societies, and other sympathizers, freed blacks began to start their own institutions.

The American Missionary Association (AMA), founded in 1846, represents one of the first organized efforts to aid in the education of Blacks. Affiliated with Congregationalists, the AMA was a repository of church-affiliated higher education in the North. Blanchard (1937) notes that the organization "set out to train a race for citizenship and to make it able to function effectively in the American body politic."[161] The work of the AMA was not initially nor solely focused on higher education but included work below the high school level. In fact, Blanchard points out, "there was no outstanding emphasis upon colleges," due in large part to the small number of students who were available for college-level work and the lack of resources even if the

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[159](...continued)
in Pearson and Bechtel (eds.), *Blacks, Science and American Education*, New Brunswick: Rutgers Univ. Press, 1989.

[160] Wilson, 1998, p. 8

[161] F.Q. Blanchard, "A Quarter Century in the American Missionary Association," *The Journal of Negro Education,* vo. 6, no. 2, (Apr., 1937), p. 155

constituency base had been larger.[162]

A number of other white Northern Christian missionary organizations were also instrumental in helping to establish colleges for newly freed Blacks. These included the Freedmen's Aid Society of the Methodist Episcopal Church, the American Baptist Home Mission Society, the Committee of Missions for Freemen of the Presbyterian Church, the American Church Institute for Negroes of the Protestant Episcopal Church. Black churches were also involved in the movement; most notably the Episcopal Zion Church, the Colored Methodist Episcopal Church, the Negro Baptist Convention, and the African Methodist Episcopal (AME) Church, which purchased Wilberforce University in Ohio in

[162] W.E.B. DuBois provides a summary analysis of the stages of Black education in the South. DuBois notes that it was simply impracticable to begin with the establishment of college-level institutions before the establishment of a common, or grade-school system. However, such schools could not exist if there were not teachers to teach them. Southern whites wouldn't and Northern whites didn't have sufficient numbers. "If the Negro was to learn, he must teach himself, and the most effective help that could be given him was the establishment of schools to train Negro teachers. This conclusion was slowly but surely reached by every student of the situation until simultaneously, in widely separated regions, without consultation or systematic plan, there arose a series of institutions designed to furnish teachers for the untaught. Above the sneers of critics at the obvious defects of this procedures must ever stand its one crushing rejoinder: in a single generation, they put thirty thousand black teachers in the South; they wiped out the illiteracy of the majority of the black people of the land, and they made Tuskegee possible." W.E.B. DuBois, *The Souls of Black Folk,* New York: The Modern Library, 2003, pp. 97-98 As such, the stage of development proceeded like this: seminaries, which were designed to provide teachers for the common-schools. Later, industrial schools which were designed to teach a trade. These industrial schools would later develop into colleges and universities.

1863.[163]

Almost twenty years after the founding of the AMA, on March 3, 1865, Congress created the Bureau of Refugees, Freedmen, and Abandoned Lands, commonly known as the Freedmen's Bureau. The Bureau, which came under the purview of the War Department, was charged with providing basic health and educational services for freedmen and displaced whites in areas occupied by the federal forces following the end of the Civil War. The AMA and Freedmen's Bureau worked closely together, helping to establish several private black schools that eventually became colleges. While the statute authorizing the establishment of the Bureau limited its life span, the Bureau would establish 4,239 separate schools, employ 9,307 teachers and instruct 247,333 pupils.[164]

Public support, aside from that provided by the Freedmen's Bureau, came in the form of land grants under the First Morrill Act of 1862, which made higher education accessible not only to the nation's elite, but also to the less wealthy.[165] The Act apportioned public lands to the states based on their representation in Congress and authorized that the lands be used to establish public colleges and universities. One must recall that at the time of

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[163] Rayford W. Logan, "The Evolution of Private Colleges for Negroes," *Journal of Negro Education.* 27, No. 3 (Summer 1958): 213-220.

[164] Ibid.

[165] U.S Department of Education, *Historically Black Colleges and Universities, 1976-1994*, NCES 96-902, by Charlene M. Hoffman, Thomas D. Snyder, and Bill Sonnenberg, National Center for Education Statistics, Washington, D.C.: 1996

the passage of the first Morrill Act of 1862 the country was still embroiled over the issue of slavery. When hostile Southern states were no longer under the scrutiny of Union troops, "funds from the Morrill Act began to flow systematically to schools offering only all-white education.[166] The U.S. Supreme Court refused to extend the Fourteenth Amendment to the Constitution, which said that all persons born in the U.S. states are citizens whose rights can not be abridged without due process, to education.[167] Jim Crow was in full force and the Supreme Court seemed to be an ally. It would take another seventy-five years for specific legislative efforts to be passed that made specific provisions for public land grant funds for tax-paying Black citizens.

The Second Morrill Act of 1890 required states with dual systems of higher education to provide land-grant institutions for both systems.[168] Eventually nineteen black colleges were organized as land-grant institutions. These were initially non-degree granting agricultural, mechanical and industrial schools.[169] According to a study conducted by the U.S. Bureau of Education in 1915, there were thirty-three black educational institutions providing college-level work.[170] However, because a significant portion of the

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[166] Ibid, p. 2

[167] Ibid.

[168] U.S. Department of Education, 1996, p. 2

[169] Ibid.

[170] Ibid. The study cited *Negro Education: A Study of the Private and Higher*
(continued...)

instruction was at the elementary and/or secondary level, these institutions were not considered college-grade.[171] There were a few exceptions, such as Howard University and Meharry Medical College schools of medicine, dentistry, and pharmacy, and full-fledged undergraduate programs at Fisk University in Tennessee.[172] A second federal survey, the results of which were released in 1927, showed a large expansion in HBCUs which were able to phase out their preparatory departments and focus on college-level offerings. In the 1927 report, 77 institutions were listed as offering collegiate work, an increase of 44 institutions from just twelve years prior.[173]

Despite these later incremental advances, the South's separate Black colleges were far from being equal or at a par with traditionally white institutions of higher education. Faculty were burdened with heavy teaching loads, low salaries, and for many, the challenge of finding institutions outside the South to work on their own post-

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[170](...continued)
Schopls for Colored People in the United States.

[171] U.S. Department of Education. *The Traditionally Black Institutions of Higher Education, 1860-1982.* By Susan T. Hill, National Center for Education Statistics, Washington, D.C.: April, 1985. The report describes the development of traditionally Black institution, and presents detailed statistical findings on enrollment, degrees, staff, financing, and facilities that cover the 1970s and early 1980s, as well as summaries of other data.

[172] Ibid.

[173] Ibid.

baccalaureate degrees, which they could only do during the summer.[174] The same federal report stated that the development of Black colleges must be greatly increased.[175]

The Matter and Manner of Education for Blacks

The question of the manner and matter of education for Blacks in the South had long been debated by African Americans and whites. In the years before the Civil War, freed slave and abolitionist Frederick Douglas proposed an industrial college for Negroes. Later, Booker T. Washington, a graduate of Hampton Institute in Virginia (now Hampton University), was also convinced that vocational education was key to the future needs of Negroes and founded Tuskegee Institute in Alabama on that philosophy. Washington differed greatly with W. E. B. Dubois who stressed the importance of a good liberal arts education for the "talented tenth" -- that educated elite of Blacks which had the cultural

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[174] Ibid. It should be noted that this discussion focuses primarily on Black higher educational opportunities and patterns of attendance in southern states that had separate systems of higher education for the races. This is not to say that African Americans could not gain access to higher education in other regions of the country; though, as Bechtel points out, one must not conclude that the educational experiences were any better or that popular beliefs and attitudes about the inferiority and limited intellectual capacity of Blacks was unique to the South. The states of Ohio, Illinois, and Oregon had laws forbidding the migration of Blacks, and in the North, there was "an undercurrent of resentment toward educating African Americans that found expression in the forcible closing of schools, the intimidation and driving away of teachers, and the destruction of school buildings." (Bechtel, 1989, p. 7.) Such resentment persisted at the higher education level as well, as reflected in the biography of Jewel Plummer Cobb at the University of Michigan in 1941 and Etta Falconer at the University of Wisconsin in 1954. (See Wini Warren, 1999.)

[175] Ibid.

and academic talents to lead the masses.[176]

Much has been written about the divergent philosophies of W.E.B. DuBois and Booker T. Washington. I will only briefly revisit that discussion here as it provides a backdrop for understanding the status of the historically Black institution at the turn of the century and the nature of their science education program.[177] Dubois and Washington both viewed education as a means for uplift for the Black community. The two differed on the form that education should take and in pursuit of what ends. Their ideas were tempered as much by their concern for Black peoples in a time of radical change, as by their own background and experiences, one as a former slave in the South and the other as a free Black whose first experience with segregation came as a college student at Fisk University in Nashville, Tennessee.

In Washington's famous Cotton States Exposition address in Atlanta in 1895, the educator/entrepreneur addressed his detractors who thought Blacks should have the opportunity to explore a liberal-based education. Washington stated that:

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[176] W.E.B. DuBois. *The Education of Black People.* New York: Monthly Review Press, 1973.

[177] For further discussions, see Herbert Aptheker, (ed.) *The Education of Black People: Ten Critiques, 1906-1960.* Amherst: University of Massachusetts Press, 1973; and Buell Gordon Gallagher. *American Caste and the Negro College,* New York: Columbia University Press, 1938.

> Our greatest danger is that in the great leap from slavery to freedom we may overlook the fact that the masses of us are to live by the productions of our hands, and fail to keep in mind that we shall prosper in proportion as we learn to dignify and glorify common labour and put brains and skill into the common occupations of life.. . . No race can prosper till it learns that there is as much dignity in the tilling a field as in writing a poem.[178]

W.E.B. DuBois, on the other hand, approached the question of education from his own experience at Harvard and with a sociological lens that examined the broader question of societal transformation. He asked:

> If. . .the races are to live for many years side by side, united in economic effort, obeying a common government, sensitive to mutual thought and feeling, yet subtly and silently separate in many matters of deeper human intimacy, if this unusual and dangerous development is to progress amid peace and order, mutual respect and growing intelligence. . . it will demand broad-minded, upright men, both white and black, and in its final accomplishment American civilization will triumph.[179]

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[178] Booker T. Washington. *Up From Slavery*. New York: Dodd, Mead & Co., 1965, p. 140.

[179] W.E.B. DuBois. *The Souls of Black Folk.* Greenwich, Conn.: Fawcett Publications, 1961, p. 84.

Nearly a century after the Civil War, two federal interventions would change the nature of African American participation in higher education and focus greater public attention on the type of education that the Black college would be able to provide. The first of these interventions was the Serviceman's Readjustment Act of 1944, or the GI Bill of Rights.[180] Passed by Congress two weeks after the Normandy invasion, the GI Bill offered those honorably discharged veterans whose schooling, college, or professional education had been interrupted by military service up to five years of full tuition plus a subsistence allowance at the college of their choice. More than one million veterans went to college or graduate school in 1946-47 on the GI Bill.[181] The Bill had a particular impact on African American veterans who made up as much as a third of HBCU enrollment and would continue to constitute a significant proportion of HBCU enrollment through 1950.[182]

The second intervention that would change the nature of African American participation in higher education was the *Brown versus of Board of Education* Supreme Court decision of 1954, which rendered illegal the notion of separate but equal and served to "deprive

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[180] Margaret W. Rossiter. *Women Scientists in America: Before Affirmative Action, 1940-1972.* Baltimore: Johns Hopkins University Press, 1995.

[181] Ibid.

[182] U.S. Department of Education, 1985

the children of the minority group of equal educational opportunities."[183] Efforts to overturn *Plessy versus Ferguson*, the 1896 Supreme Court decision which provided the basis for legalized racial separation, had begun in earnest in the mid-1930s. Several legal suits challenged the "separate but equal" doctrine in states with dual systems of education, pointing to the unequal distribution of resources to support the development of Black colleges and the lack of public graduate and professional schools available at the traditionally Black institutions.[184]

In the year immediately preceding the *Brown versus Board of Education* decision, about 75,000 undergraduate and 3,200 graduate students were enrolled at Black colleges, with an additional 44,000 students enrolled in summer programs for teacher certification and 5,000 students in extension or short courses.[185] During the 1953-54 academic year, Black institutions awarded almost 12,000 bachelor's and first-professional degrees and 1,300 master's degrees. In the years following *Brown*, African American college students still attended HBCUs, but the percent distribution would begin to shift. In 1961, Black students had been admitted to only 17 percent of public white institutions in the South. By 1965, U.S. Department of Education figures estimate that traditionally white colleges enrolled about one-fourth of Black students in the South. By 1970, this figure had

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[183] Chief Justice Earl Warren, *347 U.S. 483 (1954).*

[184] U.S. Department of Education, 1985.

[185] Ibid.

increased to 40 percent.[186] That same year, the National Association for the Advancement of Colored Peoples (NAACP) filed a class action lawsuit against the federal government to compel 10 southern states to enforce the *Brown* decision.[187] The suit continued throughout the 1970s, requiring that public Black colleges be enhanced and that traditionally white institutions increase the number of Black students and faculty on their campuses. By 1980, African American enrollment in institutions of higher education had doubled to 1.2 million; with approximately 20 percent attending HBCUs.[188]

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[186] Ibid.

[187] Ibid.

[188] Ibid. As had been the case following the end of the Civil War, changes

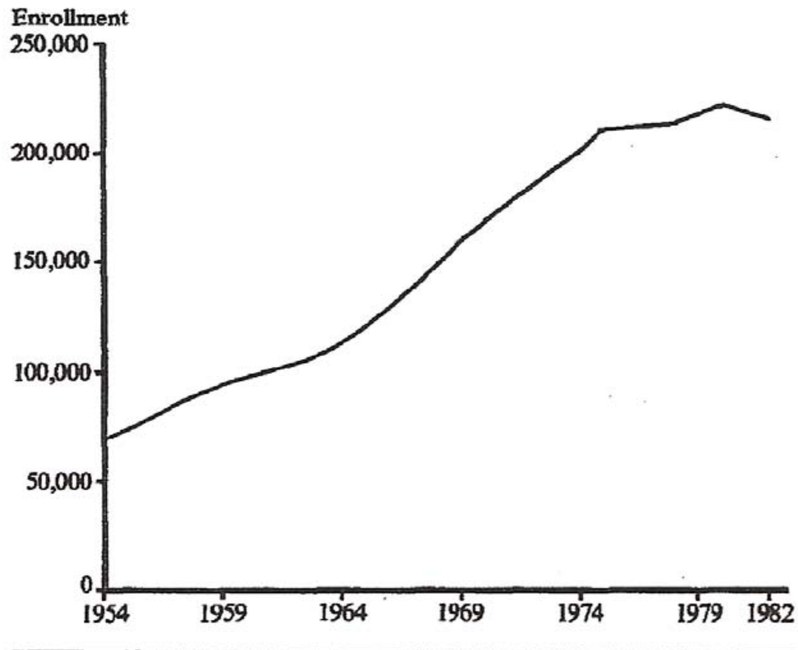

Figure 3.2: Trends in African American Enrollment at Historically Black Institutions, 1954-1982
Source: U.S. Department of Education, National Center for Education Statistics, *The Traditionally Black Institutions of Higher Education*, Washington, D.C.:, April, 1985

Education in the Era of Industrial Transformation:

Preparing Professionals and Preparing a Servant Class

At the end of the nineteenth century, U.S. society was going through an industrial transformation. The economy was moving from small factories producing light consumer goods for local markets of farmers and merchants to more complex industrial and technological systems that changed the scale and scope of manufacturing and placed greater focus on the rationalization of inventions via the research laboratory.[189] Simple trade and domestic skills would hold little social capital in the new society. They would, in fact, be rendered obsolete. In the new economy and culture of large-scale private enterprise, science and engineering would be the careers of promise. As Noble (1977) argued, "There was money in it."[190]

History – and national policies – had placed the segregated Black institution at the fringes of higher education. The scope of science instruction at these institutions was weighted under similar conditions of marginalization, and certainly nothing reflecting these new "careers of promise." Bechtel (1989) argues that the content of black schooling accurately reflected white goals for blacks in the social order. Industrial training was an effective way of ensuring that blacks could not rise beyond what was seen as their natural sphere as laborers and servants."[191]

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[189] David F. Noble's *American By Design* remains one of the best analyses of the industrial transformation of American during the late nineteenth century and the role of scientists and engineers in the process, though he is silent on the issue of race and gender and says nothing of the nation's historically Black colleges and universities. David F. Noble. *America by Design: Science, Technology and the Rise of Corporate Capitalism.* New York: Knopf, 1977. See also Alfred Chandler. *The Visible Hand: The Managerial Revolution in American Business,* Cambridge, Mass.: Belknap Press, 1977.

[190] Ibid, p. 111

[191] Bechtel, 1989, p. 8

Organizing to Improve Science

In 1943, Hubert Branch Crouch and 10 other science educators representing eight HBCUs established the National Institute of Science.[192] The organization was designed to stimulate interest in the sciences, improve science instruction, and make science functional in service to the community.[193]

Trained in zoology, Crouch completed his doctoral work at the University of Iowa and often thought about how Black scientists and science educators could communicate ideas with one another regarding ways in which to improve their pedagogy and explore research. King notes that, "except in the state of Texas, black scholars could not attend the meetings of the major professional scientific organizations representing their fields of study."[194] In states where Blacks could attend and join mainstream organizations, they

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[192] William M. King, "Hubert Branch Crouch and the Origins of the National Institute of Science, *Journal of Negro History.* 79, No. 1. (Winter, 1994): 18-33.

[193] Ibid, p. 18. The story of the formation of the National Institute of Science is instructive for several reasons, as it not only represents efforts to improve science instruction and research at HBCUs, but efforts to overcome systemic structural impediments in the science community that excluded Blacks. Equally as instructive is what the history of the organization says about the invisible role and muted voices of Black women scientists and science educators. No women were involved in the development of the organization, and it is not clear that any women were consulted as the organization went about the business of developing its mission statement and recommendations to improve science education, particularly as such speaks to the recruitment, retainment and graduation of Black female scientists.

[194] King, 1994, p. 20 Though not stated, it is assumed that in this instance, King is analyzing the 17 southern states with separate systems of higher education for African Americans – Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana,
(continued...)

were virtually ignored or failed to hold positions of importance.[195]

The differential treatment of Black scientists and HBCUs was not lost on Crouch and his contemporaries, but they were determined that Blacks should and would make clear efforts to be part of the construction of this new society, irrespective of the fact that their participation "was circumscribed by racial segregation that permeated the whole of American society."[196]

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[194](...continued)
Maryland, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia.

[195] Ibid

[196] Ibid, p. 22 For further analyses of the isolation and discriminatory treatment of African American scientists prior to 1954, see Percy L. Julian, "On Being Scientists, Humanist, and Negro," in S. L. Wormley and L.H. Fenderson (eds.), *Many Shades of Black*, New York: Morrow, 1969; M.R. Winston, "Through the Back Door: Academic Racism and the Negro Scholar in Historical Perspective," *Daedulus.*, 100:678-719; and Etta Z. Falconer, et al., "A History of Minority Participation in the Southeastern Section," a supplement to *Threescore and Ten: A History of the Southeastern Section of the Mathematical Association of America, 1922-1992*. April, 1995. The supplement was prepared following the publication and distribution in Spring 1992 of a formal history of the Section's first seventy years. Members who had been active in the organization deemed the official historical record "incomplete." There was no mention of the exclusion of minority members in the Southeastern Section of the MAA during most of the organization's history, practices that would exist well into the 1990s. The authors pointed to instances such as the southeastern section meeting in Tennessee in March, 1951 when Evelyn Boyd (Granville), Walter Brown, and H.M. Holloway attempted to attend the banquet to hear Saunders Mac Lane, president of the MAA, deliver the keynote address. According to the authors, once the chair of the arrangements committee learned that the reservations were to be used by African Americans, the tickets were canceled. Boyd, along with Lee Lorch, a white faculty member from the historically Black Fisk University in Tennessee who would emerge as a life-long champion of civil and human rights, approached Mac Lane and asked that he withdraw from the banquet or
(continued...)

Greater inclusion did not obviate the need to improve science instruction at the HBCUs. In visiting 32 HBCUs throughout the South, Crouch and his colleagues noted that the curricula had changed little from when they were undergraduates. Because science was not an administrative priority, many of the science departments had been reduced to service departments, offering courses to fulfill core requirements of other, non-science majors. In order to reverse these problems, efforts needed to focus on re-examining science content and methods of instruction; developing a survey course for general instruction; providing a mechanism to enable faculty to continue to develop professionally and to improve research and scholarship; and addressing the "responsibility of the scientists in a science centered world, and the character of cooperative and collaborative efforts with other training areas and agencies."[197]

Crouch was not alone in his sense that the science curricula at HBCUs was outdated and that the pre-*Brown vs. Board of Education* educational system of separate but equal not

[196](...continued)
openly state his objections to the discrimination. Mac Lane declined. Later, Lorch wrote to the Board of Governors, requesting that the Association implement its resolution to protect the rights of all members to participate fully and equally in organizational activities. By 1960, the Southeastern Section still was not abiding by the non-discrimination policy handed down by headquarters. This was evidenced in April of that year at a section meeting in Columbia, South Carolina. A delegation from Atlanta University (AU), which included Abdulalim A. Shabazz (then Lonnie Cross), chairperson of the mathematics department at AU who was to have presented a paper, was denied rooms at the conference hotel and the MAA refused to stand up for the Atlanta delegation. The entire AU delegation left the meeting in protest.

[197] Ibid, p. 29

only limited what should be taught (manual and industrial training) but defined what should not be taught. Gil Kujovich (1994) notes that the mandates of the Morrill Acts found a different expression in land-grant universities for Blacks.[198] The focus was on manual and vocational training for what was envisioned to be a servant class, with the only professional training relegated to preparing teachers for the segregated black elementary and secondary schools. White land-grant institutions, on the other hand, trained scientists, technicians, engineers and other professionals. Kujovich notes that, "the breadth and depth of the educational offerings at the [white] land grant universities helped to realize Justin Morrill's vision of democratization in higher education through the liberal and practical education of the industrial classes in the several pursuits and professions in life."[199]

A study by the Office of Education in 1942 revealed two very different systems of higher education.[200] In 1940, of the 17 states where land-grant HBCUs had been established, none offered a legitimate program of study for the Black student wanting to become an

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[198] Gil Kujovich, "Public Black Colleges: The Long History of Unequal Instruction," in *Journal of Blacks in Higher Education*, vol. 0, no. 3 (Spring, 1994), 65-76. Kujovich, a professor of law and former assistant secretary of education, provides an excellent overview of the dichotomy of public Black colleges. See also Henry Allen Bullock, *A History of Negro Education in the South; from 1619 to the present*, Cambridge: Mass., Harvard Univ. Press, 1967

[199] Kujovich, 1994, p. 70

[200] Office of Education, Federal Security Agency, *National Survey of the Higher Education of Negroes* (1942) as cited in Kujovich, 1994

engineer. On the other hand, "white public colleges in all 17 states [with these separate systems of higher education for whites and Blacks] had a well-developed engineering curriculum with an average offering 10 different engineering specialities."[201] The situation was no better in the sciences. "In Alabama and Georgia," Kujovich notes that "the black public colleges serving more than a third of each state's population, offered no program of study in physics, chemistry or biology."[202] Consequently, the would-be Black scientist or science teacher had to matriculate through a program of general science.

For nearly two decades, many states responded to criticisms of inequity of public education between the races with delay and eventually with an increase in funding levels, an expansion of undergraduate programs and the development of graduate programs.[203] The efforts were hasty, however, and did not reflect a deep commitment to education reform and opportunity. They were designed to forestall litigation that would reach its apex with the 1954 *Brown* decision that rendered separate institutions illegal. Larger appropriations and new facilities and programs created to ward off litigation could not bring equality in the face of decades in inequality. HBCUs had miles to go.

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[201] Kujuovich, 1994, p. 72 The 17 states included Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia.

[202] Ibid

[203] Kujovich, 1994

The Impact of Strained Resources

In October, 1955, educators attending a meeting of the American Association for the Advancement of Science, AAAS, would identify similar challenges. Edward Weaver, a faculty member at Atlanta University, would expand the topic to include science education in colleges and universities generally. Weaver argued that:

> There is no such thing as a science education for Negroes as contrasted with science education for whites. Many of the shortcomings associated with science education programs for Negroes are also associated with American schools in general, and especially those which have been 'poor,' 'southern,' and 'small.'[204]

Manning's (1983) biography of the life of the Dartmouth-trained African American cell biologist, Ernest Everett Just, reveals just how difficult the situation was for African American scientists, especially those at historically Black colleges, trying to sustain a viable science research program. Despite having graduated *magna cum laude* – twice – from two prestigious universities, and having conducted research under the tutelage of the head of the famed Woods Hole biological laboratory in Massachusetts, Just found it exceedingly difficult to gain the needed external support he sought to build a zoology

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[204] Weaver, 1956. Weaver first presented the paper at the meeting of the American Association for the Advancement of Science in Atlanta on December 28, 1955 for a section entitled "A Mid-Century Commentary on Problems of Developing Science Curricula in Racially Segregated Schools for Negroes."

program at the historically Black Howard University and continue his own work in the area of developmental physiology. Undergraduate and graduate science education and research training programs, even in the 1920s, were costly. Manning writes, "Only the most niggardly support was extended to blacks and their institutions, and since science required such a great deal of money, few black colleges had viable science departments and few blacks pursued science as a career."[205]

The Just experience was typical of the situation at HBCUs. In the 1950's, the Black public land-grant colleges oriented themselves toward practical disciplines, such as home economics, agriculture and the mechanic arts, and structured the curricula towards trades and industries. The notion of practical, Weaver argued, should change over time. Home economics, agriculture and the mechanics have their foundation in the basic sciences. Agronomists are analytical chemists; nutrition involves biochemistry; and work in textiles and clothing requires some proficiency with and knowledge of chemistry, physics and biology. As Weaver points out, however, "it is impossible for the Negro land-grant college to provide an adequate program and background for professional careers in agriculture, home economics and mechanic arts when the functional and productive segments of the plant and animal sciences are offered in the white land-grant colleges."

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[205] Kenneth R. Manning. *Black Apollo of Science: The Life of Ernest Everett Just*. New York: Oxford University Press, 1983, p.115 Just's experiences were further complicated by the lack of clear policies at Howard on the administration of grant funds, coupled with an inordinate teaching load and conflict with the university president on the role of research.

[206] In other words, the HBCUs lacked the equipment and instrumentation to provide students with the requisite research exposure.

The lack of human resources were equally distressed. Often, administrators were either unable or unwilling to release faculty from teaching assignments to engage in and sustain viable research programs and currency in their fields. Consequently, Weaver argued that directors of science units simply could not recognize the limitations of their science programs and the implications of manpower shortages to the future viability of their programs. "Their interests, professional preparation, and concern for restricted vocational opportunities occasion them to continue to stress preparation for the medical sciences, and the limited opportunities open to Negroes in governmental and/or industrial research."[207]

Legislative Intervention:
Higher Education Act of 1965, Title III and Other Set-Asides

While HBCU faculty and administrators were engaged in internal dialogue about what to do to strengthen the HBCU curricula offerings, the world outside their campuses was undergoing a dramatic shift. The nation seemed to be overwhelmed by the need to produce more scientists. Donald Quarles, assistant secretary of defense for research and

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[206] Ibid, p. 122

[207] Ibid, p. 124

development under President Eisenhower, spoke before the Fourteenth Annual Science Talent Search in February, 1955. Quarles, who also served in senior-level positions at Western Electronic and Bell Laboratories, spoke to the need to develop more scientific talent if the U.S. was to win the Cold War for technological supremacy against the Communist world. Quarles spoke to the system of supply of scientific and technical manpower, and that the re-examination of the system impacted social and educational institutions at the individual, community, state and federal levels. Pointing to the increase by the Soviets in the number of colleges and universities developed to produce professionals in science and technology and the number of Soviet students specializing in engineering, Quarles argued that "we must take stock of our own manpower resources and make sure we are developing and using them to our best advantage." While the Quarles address made repeated references to using all talent and to plugging in gaps in the manpower supply system at all levels, never once was mention made of under-represented racial minorities or women as a resource.[208]

African American educators, such as Weaver at Atlanta University, paid close attention to the rhetoric and to the federal allocation of resources. They did not view the country's Black population and the separate Black institution as separate from the national effort. With $5 billion spent on government and industrial research and the need for an estimated 250,000 scientists and engineers to engage in research and development,

[208] Donald A. Quarles, "Cultivating Our Science Talent: Key to Long-Term Security," *The Scientific Monthly* 80, No. 6 (Jun., 1955): 352-355.

Weaver, and others like him, sought to have HBCUs reflected on the national policy agenda and articulated as part of the national discourse.

Pressure brought on by the civil rights activists had succeeded in pushing through the Civil Rights Act of 1964 which said that "no person in the United States shall, on the ground of race, color or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance."[209] While this historic legislation continued to open doors for African Americans to attend mainstream, predominately white institutions, further grass-roots mobilizing and legislative intervention would focus attention on increased resources for higher education.

In particular, the Higher Education Act of 1965 expanded the federal government's role in support of colleges and universities through institutional development and student aid.[210] The act was consistent with recommendations articulated by the Carnegie Foundation on Policy Studies, which believed that the government's role should focus on the encouragement of equality opportunity; support of research capacity; distribution of

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[209] See Title VI of the Civil Rights Act of 1964, 42 U.S.C. 200d. Under Title VI, equal protection principles extended to private institutions that accept federal financial assistance.

[210] U.S. Department of Education, 1985

opportunity among the states; and concern for overall institutional health.[211]

Title III of the 1965 Act, titled Strengthening Developing Institutions, specifically authorized grants to strengthen academic quality, institutional management, and financial stability at all colleges and universities with large enrollments of low-income and minority enrollments. Part B of Title III specifically distributed funds to historically Black colleges based on a non-competitive, formula-based grant review process.[212] Fifty percent of the funds are based on the number of Pell Grant recipients; 25 percent on the number of graduates; and the remaining 25 percent for the number of the institution's graduates who enroll in a graduate or professional degree program in a discipline in which African Americans are under-represented. No institution can receive less than $500,000. Part B of Title III provides further relief for the 18 accredited HBCUs with graduate and professional programs that contribute to the number of African Americans in the legal, medical, dental, veterinary, mathematics, engineering and the physical and natural science fields.[213] Qualifying institutions receive $1 million, with the option for additional funds if the qualifying institution can demonstrate a 50 percent match with non-federal dollars.

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[211] as cited in U.S. Department of Education, 1985. For further information on the report, see Carnegie Council on Policy Studies in Higher Education. *The Federal Role in Postsecondary Education.* San Francisco: Jossey-Bass, 1975, pp. 1-4

[212] Higher Education Act, P.L. 89-329, as amended, 20 U.S.C. Section 1001

[213] Ibid

Title III was and continues to be administered by the U.S. Department of Education. By 1966 other federal agencies, particularly those with large budgets for science research, had launched programs to support "developing' universities that could not easily qualify for project grants based on peer review.[214] These federal agencies included the National Institutes of Health, the U.S. Department of Defense, and the National Science Foundation. NSF programs specifically provided support for training, curriculum and course development, and general support for the sciences and engineering.[215] NSF provided $3 million to HBCUS in fiscal year 1971 and $4.5 million in fiscal year 1981.[216] Overall, federal support, in terms of institutional development and student aid, increased from $1 billion in 1960 to approximately $4 billion in 1970 to $10 billion in 1980.[217]

Figure 3.3 and Table 3.2 below provide an historical snapshot of federal financial support for education at HBCUs as compared to mainstream institutions in the 1970s and in the 1980s. As we can see, institutional aid for both types of institutions (inclusive of funds to support faculty and curriculum development and student services) reflects a total increase over the twenty-year period. However, the traditionally white institutions still received a larger percentage of institutional aid. While student assistance (which also

[214] Bruce L.R. Smith, 1990, p. 75

[215] U.S. Department of Education, 1985

[216] Ibid.

[217] Ibid, p. 61

reflects an increase) is critical, these funds are for the students and do not expand the capacities of the institutions.

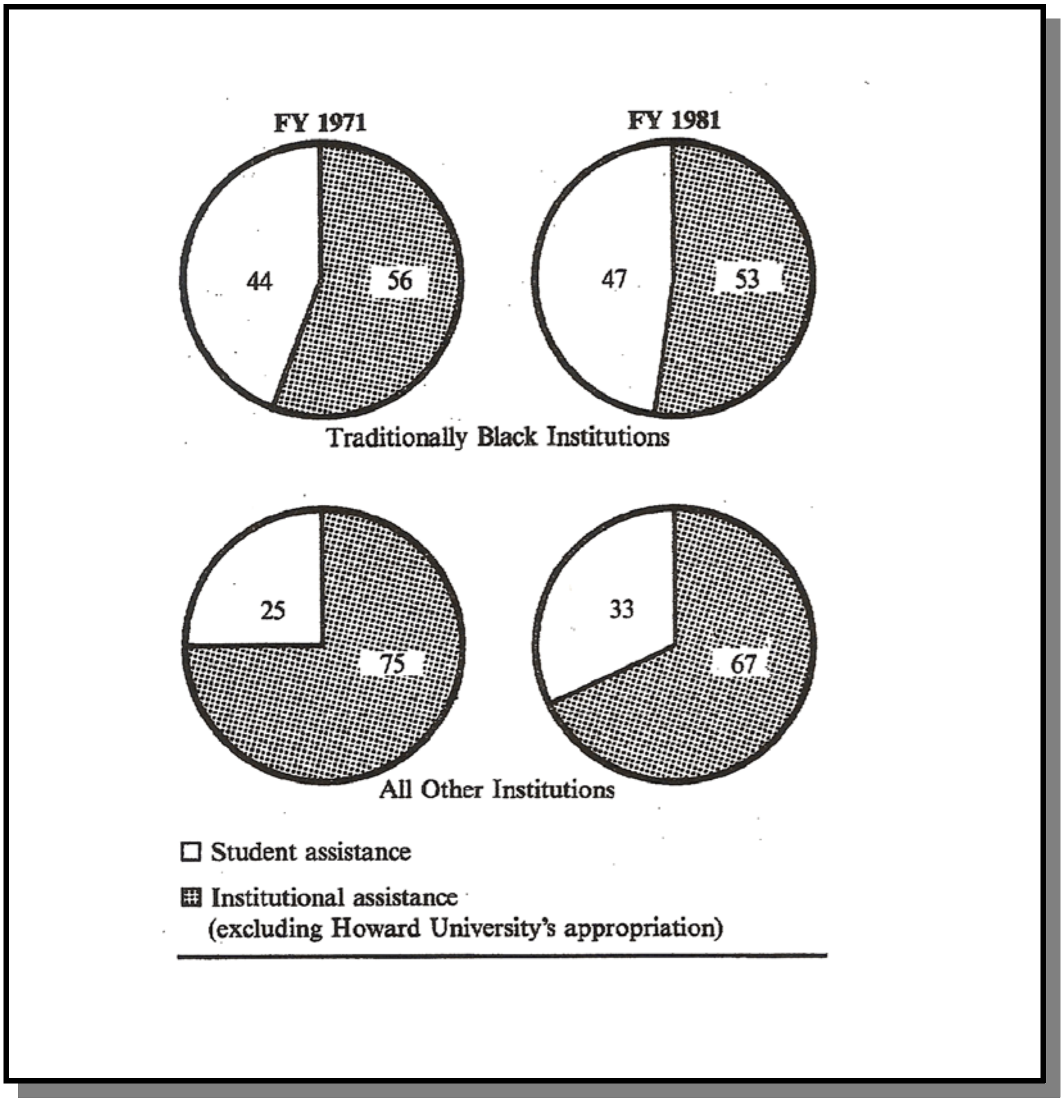

Figure 3.3 Distribution of Federal Funds in HBCUs and Predominately White Institutions, Fiscal Years 1971 and 1981.
Source: U.S. Department of Education, National Center for Education Statistics. *The Traditionally Black Institutions of Higher Education*. Washington, D.C.: April 1985, 63

When we further analyze the source of the institutional aid as reflected in Table 3.2, we see that the funding is concentrated in a few federal agencies, the Department of Education at seventy-seven percent, Health and Human Services at eleven percent and Agriculture at six percent. These three agencies account for only 75 percent of federal funds to mainstream (predominately white) institutions during the same period. More importantly, none of these top three agencies are those specifically established to support science, technology, engineering and mathematics disciplines.

Table 3.2
Comparative Ranking of Top Three Federal Agencies by Amount of Funds Awarded for Institutional and Student Aid to HBCUs and Non-HBCUs, Fiscal Year 1981

Federal department	Funds to TBI's and their students (in millions)	Department funds as a percent of all TBI obligations	Department funds as a percent of all non-TBI obligations
Total for 3 departments	$513	94	75
Education	417	77	41
Health and Human Services	62	11	28
Agriculture	34	6	6

Source: U.S. Department of Education, National Center for Education Statistics, *The Traditionally Black Institutions of Higher Education*, Washington, D.C.: April 1985, 63

Producing African American Scientists. . .In Spite of It All

Despite patterns of segregation and political and economic marginalization, HBCUs have consistently produced African American scientists and engineers at rates disproportionate to their numbers in the higher education community – even during the pre-*Brown versus*

Board of Education period. In his seminal study of the 620 Blacks who earned the doctorate in the natural sciences between 1876 and 1969, Jay (1971) notes that almost 72 percent received their undergraduate degree from a historically Black institution.[218] The leaders among these institutions are noted in Table 3.3 below. The data becomes especially interesting when compared with the leading baccalaureate-origin institutions of natural science doctorates for the general population, as reflected in Table 3.4. Of the top 20 mainstream colleges and universities, the University of Illinois is the only institution that also surfaces among the top tier of institutions producing African Americans who go on to receive the doctorate.

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[218] Because records were poorly kept, the precise number of African Americans who received the doctorate during the 1876 to 1969 time period is not definitive. Jay's estimated number is based on a previous study undertaken by Greene (1946) and records of the National Academy of Sciences. Jay actually estimates that 620 African Americans earned the doctorate over the 94-year period, but could only verify degrees for 587 of these persons. see James M. Jay, *Negroes in Science: Natural Science Doctorates, 1876-1969*, Detroit: Belamp Publishing, 1971. see also Harry W. Greene, *Holders of Doctorates Among American Negroes*, Boston: Medor Publishing, 1946.

Table 3.3
The Top 20 leading baccalaureate-origin institutions for African Americans earning natural science doctorates, 1920-1961.

Institution		Area of Doctoral Degree					
		Bio.	Chem.	Phys. Sci.	Pharm.	Agri.	Total
Howard U. (D.C.)		25	12	10	–	–	47
Morehouse (Ga.)		15	13	6	1	–	35
Fisk (Tn.)		9	5	6	1	–	21
Tuskegee (Al.)		7	8	1	–	4	20
Southern U. (La.)		10	7	–	–	2	19
Lincoln (Pa.)		10	5	1	–	–	16
Virginia State		6	3	4	1	2	16
Hampton (Va.)		6	3	1	–	5	15
Prairie View (Tx.)		8	2	1	–	3	14
Talladega (Al.)		3	3	6	2	–	14
Illinois		6	1	4	1	1	13
N.C. A&T		3	3	1	–	5	12
Lincoln (Mo.)		2	7	2	–	–	11
J.C. Smith (N.C.)		3	4	2	1	–	10
Pittsburgh		5	2	2	–	–	9
Texas Southern		5	3	–	1	–	9
Indiana Univ.		1	3	3	1	–	8

Source: James M. Jay. *Negroes in Science*. Detroit: Balamp, 1971

Table 3.4
The Top 20 baccalaureate-origin institutions for all U.S. citizens earning natural science doctorates, 1920-1961.

Institutions		No. Of Doctorates
Univ. Calif., Berkeley		2,227
Univ. of Illinois		1,987
Univ. of Wisconsin		1,647
City College of New York		1,508
Cornell Univ.		1,490
Massachusetts Institute of Technology		1,472
Univ. of Chicago		1,434
Univ. of Minnesota		1,3777
Univ. of Michigan		1,367
Harvard		1,157
Ohio State Univ.		1,102
Pennsylvania State Univ.		958
Purdue Univ.		914
Columbia Univ.		862
Iowa State Univ.		861
Univ. of Washington		773
Yale		760
New York Univ.		755
California Institute of Technology		710
U.C.L.A.		699

Source: L.R. Harmon and H. Soldz, *Doctorate Production in U.S. Universities*, as cited in James M. Jay. *Negroes in Science.* Detroit: Balamp, 1971

Chapter Conclusion

The decades following World War II saw a steady increase of federal support of university science, but all institutions did not benefit equally. The nation's more than 100 historically Black colleges and universities were at the fringes of higher education, economically and politically marginalized.

The establishment of these separate institutions was indicative of a legacy of slavery and a country that, despite its rhetoric and a bloody civil war, still took comfort in the separation of the races – particularly in the South. Government efforts were curiously inequitable, seemingly poorly thought-through and offering limited and largely inadequate resources. The Freedmen's Bureau, charged with providing educational assistance for newly freed Blacks, had only eight years to undo the illiteracy perpetuated by 200 years of slavery. The Morrill Acts of 1862 and 1890, designed to open up higher education to the masses, found different patterns of expression in the South and amongst those public land-grant institutions for Blacks than those for whites. In the former instance, the focus was on manual and industrial training for a servant class, while in the latter, the focus was on training scientists, technicians, engineers and other professionals.

At the end of the nineteenth century, the scale and scope of U.S. industrialization called for a workforce with skills in the sciences and engineering. This need was more greatly magnified in the post-WWII era, with support for higher education linked, by Congressional mandate, to national defense, economic security and global competitiveness. The HBCUs science curricula was outdated and its science programs underfunded.

Some believed that Mertonian ethos of universalism, where reward and recognition follows talent, would prevail. When that didn't work, African Americans and religious-based sympathizers, held to the notion that Christian conscience would prevail over discrimination and segregation. Others, such as Herbert Crouch, organized fellow scientists and science educators to stimulate interest in the sciences, improve science instruction and make science functional in service to the community. In Atlanta, science educators, who themselves had been educated to believe in a normative structure and the democratic principles of the republic, argued before the American Association for the Advancement of Science that there was no such thing as science education for Blacks as contrasted to science education for whites. At stake was their share of the $5 billion that the federal government had set aside under the NDEA to support strengthening science research and development. And absent improvements at their own institutions, the success of the *Brown versus Board of Education* decision of 1954 at least enabled Blacks to attend the better-resourced public white land-grant institutions.

Propelled by the social protests of civil rights activities, Title III of the Higher Education Act of 1965 made specific adjustments to increase the capacity of historically Black colleges and universities. Later, other federal agencies such as the National Science Foundation and the National Institutes of Health, developed similar capacity-building programs. The nation had adopted as rhetoric and methodology, the notion of pipeline to fill the gap in the future science and engineering resources. At best, these pipeline programs could only be described as small-scale efforts to enable HBCUs to play catch-up. When the data is analyzed, the amount of federal support for HBCUs still lagged far behind and was concentrated in those agencies whose primary missions did not focus on science – education, research or otherwise.

Despite structural patterns of segregation and economic and political marginalization, HBCUs managed to emerge as a major conduit for the production of African American scientists, mathematicians and engineers; that is, for Black men in science. But what of the Black women?

CHAPTER 4

SPELMAN COLLEGE:

A SEMINARY FOR FORMER SLAVE WOMEN AND GIRLS

> When I was praying, the Lord heard and answered. I was on my knees pleading with God to send teachers for the Baptist women and girls of Georgia. We fully believe the Lord has sent you.
>
> Rev. Frank Quarles, *The Story of Spelman College,* 1961[219]

Support for the sciences flourished in the post-World War II period, but the Soviet launch of *Sputnik* in 1959, coupled with the growing tensions fueled by the Cold War, introduced an element of fear. How had the Soviet Union surpassed the United States in scientific and technological superiority? Experts pointed to a weak educational system. The nation was not doing enough to produce sufficient numbers of trained scientists and engineers. The official position of the Eisenhower administration was that, in cultivating

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[219] As cited in Florence Matilda Read, *The Story of Spelman College*, Princeton, NJ: Princeton University Press, 1961

this talent, there should be no distinction between the sexes.[220] Instead, the nation should follow a path of “equality of opportunity to make maximum effective use of intellect and ability.”[221] This was, after all, a basic precept of democracy.

It would soon be revealed that the nation was sending mixed messages. Women were needed, but their “female temperament” made them better suited for positions that required routine and repetitive tasks, such as laboratory technician or patent searching. *Woman Power*, published in 1954 by the National Manpower Council of Columbia University, “barely hinted that some women might be or become scientists or engineers.”[222] Noted national figures such as Otto Kraushaar, president of Goucher College (originally established as the Baltimore College for Women), openly deplored what he identified as the great waste of talent among girls, but suggested that “our colleges for women are in an excellent position to *recruit and educate science teachers* [emphasis added] for elementary and secondary schools.”[223] In other words, women could *teach* but not do; *nurture* but not become – professional scientists.

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[220] Office of Defense Manpower, Executive Office of the President, Defense Manpower Policy No. 8: Training and Utilization of Scientific and Engineering Manpower, Washington, D.C., 1952 as cited in Margaret Rossiter, *Women Scientists in America Before Affirmative Action, 1940-1972,* Baltimore and London: Johns Hopkins Univ. Press, 1995

[221] Ibid, p. 53

[222] Ibid, p. 59

[223] Ibid, p. 57

Despite such mixed messages and sometimes overtly hostile attitudes and discouraging atmospheres, record numbers of women did enroll and complete their doctoral degrees in science and engineering programs. According to the U.S. Department of Education, between 1947 and 1960, the U.S. produced 3,028 female scientists and engineers at the doctoral level.[224] While this figure paled in comparison to the 57,803 men that had been awarded science and engineering doctorates during the same time period, it was nearly twice the 1,531 doctoral degrees that had been awarded to women up until that time.[225] When the figure is dis-aggregated to account for race, further disparities are revealed. White women were increasing in their numbers, but the same could not be said for African American women.

Between 1876 and 1969, a mere 58 Black women were awarded the science doctorate.[226]

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[224] Margaret Rossiter, *Women Scientists in America Before Affirmative Action, 1940-1972,* Baltimore and London: Johns Hopkins Univ. Press, 1995, pp 81-82. These figures are exclusive of degrees in the social sciences and psychology.

[225] Margaret Rossiter, *Women Scientists in America: Struggles and Strategies to 1940*, Baltimore and London: Johns Hopkins Univ. Press, 1982.

[226] James M. Jay, *Negroes in Science: Natural Science Doctorates, 1876 - 1969,* Detroit, Michigan: Balamp Publishing, 1971. For the same time period, Jay estimates that a total of 620 African Americans were awarded the natural science doctorate and that 72 percent of these individuals had their baccalaureate origin at an HBCU. However, because records were poorly kept, the precise number of African Americans who received the doctorate during the 1876 to 1969 time period is not definitively known. Jay's estimated number is based on a previous study undertaken by Greene (1946) and records of the National Academy of Sciences. Jay actually estimates that 620 African Americans earned the doctorate over the 94-year period. However, Jay could only verify degrees for 587 of these persons. see also Harry W. Greene, *Holders of Doctorates*

(continued...)

As reflected in Table 4.1, similar to the higher education of African Americans generally, the historically Black college would be responsible for the largest percentage of degree production. Howard University in Washington, D.C. led as the baccalaureate-origin institution of 12 of the 58 Black women science doctorates. Tied with Tuskegee Institute (now Tuskegee University) in Alabama for second on the list with four was Spelman College.[227]

[226](...continued)
Among American Negroes, Boston: Medor Publishing, 1946.

[227] The four Spelman alumnae who would earn the science doctorate prior to the 1970s were: Mary Logan Reddick with the Ph.D. in Biology from Radcliffe College in 1944; Johnnie (Prothro) Hines with the Ph.D. in Food and Nutrition Chemistry from the University of Chicago in 1952; Eleanor L. (Franklin) Ison with the Ph.D. in Zoology from the University of Wisconsin in 1957; and Rosalyn Patterson Mitchell with the Ph.D. in Biology from Emory University in 1967. A fifth Spelman alumna, Virginia Rose Hannon, earned the D.Sc. In Hygiene from Harvard in 1968. Spelman College, *Report of the President*, April, 1968.

Table 4.1
Baccalaureate origins of
African American female natural science
doctoral degree recipients, 1876-1969

Institution	Number
Howard University (Washington, D.C.).	12
Spelman College (Atlanta, GA)	4
Tuskegee Univ. (Tuskegee, AL)	4
North Carolina Central University	3
Hampton Institute (Hampton, VA)	2
Wayne State University (Detroit, MI)	2
Other schools	30 (1 each)

Source: James M. Jay. *Negroes in Science*. Detroit, MI: Balamp, 1971.

Spelman and Science Graduates in the Post-WWII Period: Historical Circumstance

Spelman's place in 1953 as the second leading baccalaureate-origin institution for Black women science doctoral recipients (tied with Tuskegee University in Alabama) was an expression of historical circumstance, not any deliberate plan or design by faculty, administrators or the four white college presidents who would lead the institution during its first 72 years of existence.[228] Spelman was, after all, one of only three surviving single-sex institutions of higher learning specifically for Black women,[229] particularly notable during a period where to be Black and female equated to a life of limited opportunities and scarce resources. Higher education held out a promise of hope and a chance to escape a "lifetime of 'work-oxen and hoes,' 'brooms and cook-pots;'" and in

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[228] These four women were Harriet E. Giles, serving from 1881-1891; Sophia B. Packard, 1891-1910; Lucy Hale Tapley, 1910-1927; and Florence M. Read, 1927-1953. More will be said later in this chapter about the tenure of these presidents and the impact of their backgrounds and philosophies on the direction of growth of Spelman College. However, for a more detailed analysis about the early history of Spelman and its first four presidents, see Yolanda E. Watson and Sheila T. Gregory. *Daring to Educate: The Legacy of the Early Spelman College President*. Sterling, Virginia: Stylus Publishing, 2005.

[229] The majority of African American women have been educated in co-educational institutions; Mary Jane Patterson, for example, attended Oberlin College and in 1862 became the first Black female to earn a college degree. However, with a limited amount of resources available for the establishment of Black institutions following Emancipation, it was simply more economical to educate Black men and women together. The single-sex institution has been atypical, though a few did exist. By 1953, however, only three remained: Spelman, along with Bennett College in Greensboro, North Carolina and Barber-Scotia in Concord, North Carolina. Bennett, which would also account for significant percentages of African American female science baccalaureate recipients, began as a co-educational institution in 1873 but was re-organized as a woman's college in 1926. Barber-Scotia began enrolling men in 1954. The other single-sex historically Black colleges that have existed for women included Bethune-Cookman, established in Daytona Beach, Florida in 1904. Bethune-Cookman was the result of the merger of Cookman Institute, originally established for men, and Daytona Educational and Industrial School, originally established for Black women. In 1923 the two institutions merged. Lastly, Huston-Tillotson, established in 1875 in Austin Texas, is the result of the merger of Tillotson College and Samuel Huston College. In 1925, Tillotson changed to a woman's college but reverted to its co-educational, four-year status in 1931. The two institutions merged in 1952. In February, 2005, the institution officially changed its name to Huston-Tillotson University but still remains an undergraduate liberal arts institution. See, Juan Williams and Dwayne Ashley. *I'll Find a Way or Make One.* New York: HarperCollins, 2004.

far too many cases, the constant threat of sexual abuse and exploitation.[230]

Spelman College provided a safe place for Black women to define a path around those limitations. Its founders, Sophia B. Packard and Harriet E. Giles, were two white female missionaries from New England who were committed to the philosophies and ideals of women's education -- *as tempered by Baptist missionary doctrine* – and attempted to import that philosophy to Atlanta in the decades following the end of Reconstruction. However, the matter and manner of the higher education of Black women in separate institutions in the South would follow a different trajectory than their predominately white, northeastern counterparts. That "differentness" bears brief detailing here in further exploring the college's early institutional development and analyzing how Spelman would break from racial and gender scripts to educate African American women as scientists.

Spelman as Part of the History of Women's Education: A Difference of Race and Region

Similar to HBCUs, women's institutions grew out of a legacy that marginalized females

[230] Stephanie Shaw. *What a Woman Ought to Be and Do; Black Professional Women Workers During the Jim Crow Era.* Chicago, Illinois: University of Chicago Press, 1996, p. 1 Paula Giddings talks about the sexual harassment Black women would face in white homes as domestics and how these women perceived education as a pathway to more respectable occupations that would shield them from sexual exploitation. See Paula Giddings. When and Where I Enter: The Impact of Black Women on Race and Sex in America., New York: William Morrow and Co., Inc., 1984.

and barred girls from school for almost two centuries. When women were allowed to become active participants in higher education during the nineteenth century, they did so against a backdrop which purported “equality of intellectual opportunity,” but only to those tasks deemed appropriate to a women’s sphere in her role as wife, mother and domestic caregiver.[231] Emily Davies (1973) argued that the prevailing sentiment of the period was that “. . .no education would be good which did not tend to make good wives and mothers; and that which produces the best wives and mothers is likely to be the best possible education.”[232]

The increase of women in activities outside the home was met with demands for

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[231] Jeanne Noble. *The Negro Woman’s College Education,* New York: Garland Publishing, Inc., 1987, as cited in Watson and Gregory, 2005, p. 47

[232] Emily Davies. *The Higher Education of Women.* New York: AMS Press, Inc., 1973 as cited in Watson and Gregory, 2005, p. 47 For more detailed discussions of women’s role and the history of women’s education see Noble, *The Negro Woman’s College Education*, New York: Garland Publishing, Inc., 1987; Elizabeth Barber Young, *A Study of the Curriculum of Seven Selected Women’s Colleges of the Southern States*, New York: Teachers College, Columbia University, 1932; Helen Lefkowitz Horowith. *Alma Mater: Design and Experience in the Women’s Colleges from Their Nineteenth Century Beginnings to the 1930s.* New York: Alfred A. Knopf, Inc., 1984; Florence Fleming Corley, “Higher Education for Southern Women: Four Church-Related Women’s Colleges in Georgia, Agnes Scott, Shorter, Spelman, and Wesleyan, 1900-1920,” Dissertation, College of Education, Georgia State University, 1985; Linda M. Perkins, “The Impact of the ‘Cult of True Womanhood’ on the Education of Black Women,” in Lester F. Goodchild and Harold S. Wechsler, (eds.), *ASHE Reader on the History of Higher Education.*, Needham Heights, MA: Ginn Press, 1989; Johnetta Cross Brazzell, “Brick Without Straw: Missionary-Sponsored Black Higher Education in the Post-Emancipation Era,” *The Journey of Higher Education.* 3, No. 1 (Jan. - Feb. 1992): 26-49; and Beverly Guy-Sheftall, “Black Women and Higher Education: Spelman and Bennett Colleges Revisited,” *The Journal of Negro Education.* 51, No.3 (Summer 1982): 278-287.

curricular change.[233] By 1886, women's institutions were establishing policies that directed students away from ornamental subjects such as music, art, elocution and other courses thought to refine a woman. Instead, the northeastern women's colleges were establishing more academic channels that included college-level curricula that closely reflected offerings at men's institutions.[234] Margaret Rossiter (1982) argues that this great transformation in women's education, from informal learning to academies and seminaries to colleges, would have a profound impact on the ability of women to study science systematically and ultimately enter scientific professions and that the single-sex college for women would provide the "entering wedge."[235]

Independent women's colleges such as Vassar (established in New York in 1865), Smith, Wellesley and Mount Holyoke colleges, (established in Massachusetts in 1871, 1875 and 1837, respectively), and Bryn Mawr College (established in Pennsylvania 1885) would distinguish themselves as elite institutions providing curricular offerings at a par with men's and co-educational institutions. This elite group of northeastern women's college, advantaged because of their sizeable endowments, nondenominational administrations, and "their almost feminist commitment to excellence in women's education," would also

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[233] Elizabeth Barber Young, *A Study of the Curriculum of Seven Selected Women Colleges of the Southern States*, New York: Teachers College, Columbia Univ., 1932

[234] Ibid.

[235] Rossiter, 1982, p. 28.

prove pivotal in educating women in science.[236] By 1887, Vassar had procured scientific equipment worth $54,000 and recruited notable scholars such as Maria Mitchell, an astronomer who Rossiter describes as "the most important woman scientist in America in the nineteenth century."[237] At age twenty-eight, Mitchell calculated the position of a new comet, observed it across the sky, and amidst controversy, won the gold medal the king of Denmark had promised the discoverer. Despite later feats of being elected the first woman member of the American Academy of Arts and Sciences, the American Association for the Advancement of Science, and in 1869, one of the first American women in the American Philosophical Society of Philadelphia, Mitchell would be relegated to work as a part-time librarian, perform computer work for the U.S. Coast and Geodetic Survey on the side, and assist her father at his observatory at their home on Nantucket Island, off the coast of Massachusetts. In 1862, when Matthew Vassar decided he wanted to have a prominent woman scientist on his faculty, Mitchell was available.[238]

Bryn Mawr College, a northeastern women's college established by the Religious Society of Friends, or Quakers, in 1885, provides a striking contrast to the philosophy and ideologies that influenced Spelman College. From the very beginning, it was clear that

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[236] Rossiter, 1982, p. 10

[237] Ibid., p. 12

[238] Ibid.

the Bryn Mawr curriculum would emphasize the rigors of scholarship and academics. The 35 undergraduate and seven graduate students who formed the student body during Bryn Mawr's first year of operation received instruction according to the Quaker principles in Greek, Latin, French, German, Italian, Spanish, Philosophy, History, Political Science, Mathematics, Physics, Chemistry and Biology.[239]

One might argue that it was Martha Carey Thomas, Bryn Mawr's second president from 1894 through 1922, who truly fashioned a home at Bryn Mawr that would respect scholarship irrespective of gender.[240] Thomas was particularly concerned with adapting and imposing the European model of higher education, with its emphasis on oral examinations, scholarship and research. Future leaders of Bryn Mawr – Marion Edwards Park, Katherine Elizabeth McBride, Harris Wofford, and Mary Patterson McPherson -- would carry this spirit of gender educational equity and parity well into the twentieth century.

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[239] Cornelia Meigs, *What Makes a College: A History of Bryn Mawr*, New York: MacMillan, 1956.

[240] Martha Carey Thomas was the eldest daughter of James Carey Thomas, a close friend of Bryn Mawr founder Joseph Taylor, and had served for ten years as Dean of Faculty under Bryn Mawr's first president, James Rhoads. M. Carey Thomas was also no stranger to the challenges of women in higher education during the early twentieth century. She was the first woman to receive an undergraduate degree from Cornell University. After being refused entry for graduate study at the Johns Hopkins, she continued study in Germany where she was twice refused her doctorate, even though she had completed all required course work and the dissertation. Thomas found final refuge in Switzerland where she graduated *summa cum laude*, specializing in English and German philology. Ibid, p. 70

The emphasis on science at Bryn Mawr was not simply a natural outcome of historical circumstance but a deliberate effort. The college consciously worked to create a climate and culture that was conducive to educating women in science. Some of the most notable women in science and mathematics held faculty positions at Bryn Mawr – Charlotte Angas Scott, the first head of the Bryn Mawr mathematics department and the only woman among the institution's eight original faculty; Anna Pell Wheeler, the first woman to deliver a colloquium before the American Mathematical Association, joined Bryn Mawr in 1918; and Emmy Noether, a refugee from Nazi Germany who is considered the founder of modern abstract algebra, came as visiting professor in 1933.[241] The Science Center, constructed in 1938 as the country experienced the depths of an economic depression that left more than nine million unemployed and homeless, would provide laboratories for chemistry and geology.[242]

The Question of the Education of Black Women

in the Post-Emancipation Era

Watson and Gregory (2005) argue that the route to academic, more liberal education for

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[241] *Bryn Mawr Alumnae Bulletin*, May 1922; *Bryn Mawr Alumnae Bulletin*, Summer 1966; and Address delivered by Professor Herman Weyl at a Memorial Service held at Goodhard Hall, Bryn Mawr College, April 26, 1935. (Bryn Mawr Archives, Bryn Mawr, Pennsylvania.)

[242] An annex with labs for biology would be added in 1957, and another building, constructed in 1963, would provide space for physics and mathematics. Bryn Mawr College, "The Self-Study Report for the Middle States Association of College and Secondary Schools," 1978.

Black women proceeded along a different continuum that would always be complicated by race.[243] In the post-Emancipation era, questions arose as to whether Black women deserved or were capable of being educated and the type of education they should receive.[244] The prevailing sentiment was that Black women should be trained to teach in order to uplift and aid in the improvement of the race, a burden which was never placed upon white women, and which never became a part of the formal curriculum at white women's colleges as it would with single-sex institutions for Black females.[245] Similarly, the curriculum at Black women's college was geared towards occupational areas deemed appropriate for Black women to pursue. White philanthropic organizations and white members of society viewed the notion of Blacks being educated "for education's sake" as impractical and began to agitate for a more utilitarian approach to the education for African Americans, particularly African American women.[246] According to Watson and Gregory, "large vocational and professional departments began to emerge on Black women's college campuses seeking to train Black female teachers, nurses and domestic

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[243] Yolanda L. Watson and Sheila T. Gregory, *Daring to Educate: The Legacy of the Early Spelman College Presidents*, Sterling: Virginia, 2005, p. 49

[244] Noble, 1987

[245] Giddings, 1984, as cited in Watson and Gregory, 2005

[246] Watson and Gregory, 2005, p. 53. As I have already indicated in the previous chapter, the debate about the type of education African Americans should receive also existed within the African American community, as was so famously captured in the writings of Booker T. Washington and W.E.B. Dubois.

workers.[247]

The focus on practical utility and vocational training for Black women is not to imply that this issue did not cross the racial divide. According to Watson and Gregory, "White and Black female collegians 'were caught between the attraction of using their education in professional ways and keeping in mind that a woman's usefulness was not equated with professionalism.'"[248] The difference, however, lay in the increasing ability of white women to influence those curricular offerings to reflect options consistent with a liberal arts philosophy. "It was not until the 1920s and 1930s that significant numbers of elective courses were offered at Black colleges," write Watson and Gregory, "while colleges such as Wellesley had been doing so since the 1880s."[249] In the area of science, the two authors argue that the older women's college in the northeast emphasized the importance of the sciences, excelled in them, and continued to emphasize the importance of the sciences well into the early twentieth century.[250] In the South, irrespective of race, the curricula designed for white and Black women lagged behind the northeastern, white women's colleges and resembled what Watson and Gregory describe as a "cat and

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[247] Ibid, p. 54

[248] Young, 1932, as cited in Watson and Gregory, 2005, p. 54

[249] Watson and Gregory, 2005, p. 55

[250] Ibid, p. 53

mouse" game.[251] Black and white southern women's colleges were attempting to emulate and catch up with the curricula developments of the northeastern white women's institutions, while the latter was attempting to emulate what the men were studying.[252]

As a women's college, Spelman is often referred to by those outside the scholarly community within the same context of the Seven Sister institutions [253] Spelman's history was wrapped up in this educational milieu of higher education for women and differences in how that educational process would play out based on race and region. "The curricular foundation that spanned the years 1881 to 1953," write Watson and Gregory, "although not often reflected in the public history of Spelman College, can be attributed to the power and legacy of four white women who purposefully and strategically determined the educational focus and opportunities for their Black female students."[254]

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[251] Ibid, p. 57

[252] Ibid.

[253] For a greater discussion on the higher education of Black women, see Beverly Guy-Sheftall, "Black Women and Higher Education: Spelman and Bennett Colleges Revisited," in *The Journal of Negro Education,* Vol. 51, No. 3, Summer, 1982, 278-287. Guy-Sheftall has argued that "authoritative" scholarly treatments on higher education for women have focused narrowly on the Seven Sister schools, grossly ignored Black women, or suffered from generalizations that primarily reflect the experiences of white women. See also Beverly Guy-Sheftall and Patricia Bell-Scott, "Finding A Way: Black Women Students and the Academy," in C.S. Pearson, D.L. Shavlik and J.G. Touchton eds., *Educating the Majority: Women Challenge Tradition in Higher Education*, New York; Macmillian Publishers, 1989

[254] Watson and Gregory, 2005.

For Sophia B. Packard and Harriet E. Giles, who first founded Spelman as the Atlanta Baptist Female Seminary in 1881, their backgrounds as missionaries and educators who strongly believed in women's education, heavily influenced their focus on "saving the lost souls" of the former slave women of the South. Writing in her diary in 1895, Giles spoke of "the appalling need of help for the colored women and girls, and of the conviction that "their lives [Packard and Giles] should be given to the education and Christianization of these downtrodden people. . .these women and girls who have never had a chance."[255] After months of pleas and proposals by Packard and Giles, their sponsoring organization, the Woman's American Baptist Home Mission Society (WABHMS), passed a resolution on March 24, 1881 appointing fifty-seven-year-old Packard and forty-eight-year-old Giles as teachers to Atlanta, Georgia.[256] Having raised pledges of $150, Packard and Giles made the sojourn to Atlanta, arriving on April Fool's Day. As the story goes, Packard and Giles knocked on the door of Friendship Baptist Church, explained their mission to the elderly Reverend Frank Quarles, a prominent Black minister, who replied:

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[255] As quoted in Florence Matilda Read, 1961, p.38

[256] Ibid, p. 40

> When I was praying, the Lord heard and answered. I was on my knees pleading with God to send teachers for the Baptist women and girls of Georgia. We fully believe the Lord has sent you.[257]

Eleven pupils, former slaves and daughters of former slaves, made up the first class of what would be named the Atlanta Baptist Female Seminary. The number would increase to 80 by the time the school closed for summer recess in July.[258] Students learned how to read, write and do basic arithmetic, and were given instruction in personal and domestic hygiene and norms of conduct. They learned about the Bible and "were strongly encouraged to accept Jesus Christ as their personal savior."[259] This early conscription included "normal" training, or a focus on teacher preparation. An Industrial Department was opened in 1881, followed later by a nurse training in 1886 and missionary training in 1891.[260] In a letter to Gen. Morgan, corresponding secretary for the Atlanta Baptist Home Mission Society, Giles made her beliefs clear, noting that, "I consider industrial training more important in Negro schools than in white schools, inasmuch as there is a lack of intelligent training in labor among Negroes in their

[257] Ibid, p. 43

[258] Ibid, p. 45

[259] Ibid, p. 65

[260] Ibid.

homes."[261]

In 1882, Packard and Giles met and made a financial appeal to the industrial oil magnate, John D. Rockefeller, in support of their efforts. Rockefeller was married to Laura Spelman, a student from the Oread Collegiate Institute, one of the first institutions where Packard and Giles had taught. Impressed by their appeal, Rockefeller pledged an initial $250 for the building fund and would eventually contribute more than half of the $11,500 debt. In turn, the school was named in honor of his wife, Laura Spelman Rockefeller, and her parents, Mr. and Mrs. Harvey Buel Spelman, as the Spelman Seminary on April 11, 1884.[262]

On June 21, 1891, Packard died at the age of sixty-nine. At the time of Packard's death, the school had grown from a group of 11 students gathered in the basement of Friendship Baptist Church to 800 pupils, 30 teachers and property valued at $90,000. Packard's life-long partner, Harriet Giles, served as president of Spelman Seminary for the next 18 years. Under Giles' administration, Spelman would increase its focus on teacher training and add a department offering college-level instruction in 1897. The school conferred its

[261] Letter from Harriet Giles to Gen. Morgan, dated January 24, 1901 as quoted in Beverly Guy-Sheftall and Jo Moore Stewart, *Spelman: A Centennial Celebration,* Atlanta: Spelman, 1981, p. 29

[262] Ibid, p. 84

first two college degrees in 1901 and an additional 11 degrees by 1909.[263] In November of that year, Giles would die in office at the age of 76.

The work of Spelman's founders, Packard and Giles, must be examined relative to time and place and within the context of societal perceptions of who Black women were and what they should be in the post-Civil War era. When Packard and Giles made the sojourn to Atlanta, their goal was fairly straightforward — to open a school where former slave women and girls could learn to read and write, adopt Christian virtues of morality, and develop skills to be good homemakers and teachers in the community. The notion of a liberal arts education, which was available at the northern colleges established for white women, had not yet taken hold, and certainly nothing rising to the level of educating Black, female scientists was in their frame of thinking.[264] In 1883, the curriculum offered academic courses based on two tracks; one that emphasized the intellectual, which included mathematics, English grammar and literature, geography, and natural philosophy, and the other which highlighted the industrial, including cooking, sewing,

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[263] Spelman College, *Report of the President*, April, 1957.

[264] It should be noted, however, that the Lucy Houghton Upton, appointed acting president following the death of Harriet Giles in 1909, did articulate a vision for Spelman that was more akin to the role that the Quaker-sponsored institutions for women in New England. Upton came to Spelman Seminary in 1888 to assist the founders, Packard and Giles. Upton was appointed associate principal following the death of Packard in 1891. At the fifteenth anniversary celebration of Spelman in 1896, Upton remarked that, "We see in imagination, among the daughters of Spelman, college graduates, physicians, poets, editors, artists," and that Spelman would grow to carry on more advanced "work that is in the line of the purpose of its existence. Spelman ought to become the Wellesley of the South." Read, 1961, p. 133.

general housework and laundry work.[265]

The content of the Spelman curricular offerings, however, was also influenced by a network of actors external to the Spelman campus. External pressures from financial benefactors, such as the John F. Slater Fund, dictated that the school have an industrial training component.[266] A grant request to the George Foster Peabody in 1902 to support a multi-disciplinary nature study of plant classification, human physiology and laboratory experiment was awarded under the condition that Spelman change the parameters of the research to focus on something more practical that would “teach the girls how to raise vegetables and small fruits and how to take care of poultry.”[267] Packard and Giles had to learn how to politically balance the need to secure funds to keep the school running with a commitment to their own educational philosophies.

Spelman at the Turn of the Century:

From Seminary to College

Following a year with Lucy Upton as acting president, the Board of Trustees appointed Lucy Hale Tapley, a member of the faculty, as permanent president in 1910. Tapley

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[265] Matilda Read, 1961, p. 87

[266] Brazzell, 1992.

[267] Letter from Jean Davis to George Foster Peabody, 14 June 1902 as cited in Johnetta Cross Brazzell, “Bricks without Straw,” in *Journal of Blacks in Higher Education*, vol. 63, no. 1 (January/February 1992), p. 42

came to Spelman from Maine in 1890, initially teaching English and arithmetic but eventually rising to head of the Teachers Professional Department. As Florence Read (1961) recounts, “from the beginning of Miss Tapley’s administration, her annual reports to the trustees stressed industrial training.”[268] In those reports, Tapley argued that “any course of study which fails to cultivate a taste and fitness for practical and efficient work in some part of the field of the world’s needs is unpopular at Spelman and finds no place in our curriculum.”[269] For Tapley, practical and efficient included nurse and teacher training, home economics, and courses such as “chicken culture,” where students learned the appropriate way to raise and prepare chickens.[270]

Watson and Gregory argue that Tapley’s emphasis on vocational training “had more to do with Spelman’s need to access funds from private philanthropies whose focus had become vocational than Tapley’s adverse sentiment about the trajectory of the Spelman

[268] Florence Matilda Read, 1961, p. 190

[269] Ibid, p. 191

[270] Watson and Gregory, 2005, p. 86 As I have pointed out in Chapter 2, the debate over the type of education that would be afforded African Americans, classical versus industrial, had been waging since Emancipation and was a constant source of discussion in the African American community. The two most public and vocal figures within this debate were Booker T. Washington, founder of Tuskegee Institute (now Tuskegee University in Alabama) and the Harvard-trained sociologist W.E.B. Dubois, who taught at Atlanta University, a neighboring HBCU near Spelman College. While DuBois favored a more liberal arts-based education, Washington argued that there was dignity in learning industrial trades. Both men were talking about the education of African American men. There was never a debate about the education of Black women.

curriculum or the school as a whole."[271] This assertion is debatable. Everything leading up to Tapley's appointment as president focused on vocational occupations, and major capital improvements under her administration continued to emphasize vocational instruction.

The first capital improvement under the Tapley administration came in 1917 when the Bessie Strong Nurses Home enabled Spelman to strengthen courses in nurse training, including preparing students to sit for the state certification exam.[272] A second facility, the Laura Spelman Home Economics Building, was completed in 1918. Home Economics constituted its own separate curriculum at Spelman and was the only major in which students were awarded the bachelor of science degree. The focus on home economics was important. Although the discipline would eventually emerge as a staple in most women's college, as Watson and Gregory note, "early attempts to introduce home economics into the curriculum of leading White women's colleges met with failure."[273] The courses were not considered as intellectually rigorous or competitive as the courses being taken by males in the leading liberal arts colleges in the north, which the northeastern, white women's colleges were perpetually attempting to emulate. It was only after northern women's colleges found ways to give greater validity to curricula

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[271] Watson and Gregory, 2005, p. 85

[272] Read, 1961.

[273] Watson and Gregory, 2005, p. 55

offerings related to domesticity, such as combining science with traditional home economics, that such courses gained greater acceptance as a viable and valid course of study in women's college. [274] Finally, in 1925, the new science building, was completed, partially alleviating the need to use the facilities at neighboring Morehouse College. The new building was named in honor of Tapley and included separate college and high school laboratories for physics, biology and chemistry, along with lecture rooms, classrooms and offices.[275]

Expansion of the campus' physical plant to include construction of facilities to continue and expand training in nursing and home economics, as well as to offer on the Spelman campus high school and basic college-level science was consistent with Tapley's focus on vocational instruction that would prove practical.[276] The addition of the newer facilities also increased Spelman's capacity to move toward becoming a full-fledged college, a move which, according to a letter written by Tapley in 1923 to then chair of the Spelman Board of Trustees, D.G. Garabrant, had been under consideration by members

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[274] Ibid.

[275] Florence Matilda Read, 1961, p. 201 A fourth major facility would also be constructed during Tapley's administration, Sisters Chapel. Dedicated in May 1927, Sisters Chapel was in keeping with Spelman's motto, "Our Whole School for Christ." It was established in order to keep God central in the life of the campus. The facility was named for Rockefeller's mother and aunt, Laura Spelman Rockefeller and Lucy Maria Spelman.

[276] Read, 1961, p. 191

of the American Baptist Home Mission Society, for quite some time.[277] According to Tapley's 1923-24 Annual Report to the Board of Trustees, the total number of students doing work at the high school and college level had reached 536, as compared to 483 during the previous academic year.[278] Of the 82 students who enrolled during 1923-24 at the college level, only 25 students were matriculating along the liberal arts track.[279] Thirty-five of these students were majoring in elementary education and 22 in home economics education. But instead of receiving the college degree, the students were awarded diplomas.[280] Nevertheless, based on these accomplishments, the Board of Trustees passed a resolution to amend the charter and change the name from Spelman Seminary to Spelman College, effective June 1, 1924.[281] Three years later Lucy Tapley ended her tenure as president.

Through Depression and World War:
An Increased Focus on Collegiate Status

Florence Matilda Read was elected Spelman's fourth president on June 15, 1927. A graduate of the all-female Mount Holyoke College in Massachusetts, Read's appointment

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[277] Letter from Tapley to D.G. Garabrant, January 26, 1923, as quoted in Watson and Gregory, 2005, p. 92

[278] Ibid.

[279] Ibid.

[280] Read, *The Story of Spelman College*, 1961, p. 198

[281] Ibid.

continued a tradition of white, New England women leading the institution. She had no teaching or higher education administrative experience but had previously worked with the International Health Board, an agency of the Rockefeller Foundation, thus continuing Spelman's long association with the Rockefeller family. As Read stepped into the Spelman presidency, the challenge that lay before her, as she viewed it, was to transition Spelman with a greater level of effort from its emphasis as a normal school, focused fundamentally on teacher training, to a liberal arts college.

Table 4.2
Spelman College Student Profile, 1927-28

College Level	125 students
Senior High School	170 students
Junior High School	137 students
Elementary School	138 students
Nurse Training Department	17 students

Source: Florence Matilda Read. *The Story of Spelman College.* Princeton, NJ: Princeton University Press, 1961.

Spelman had chartered the right to grant college degrees since 1901, but had only granted 62 such degrees between that date and May, 1928.[282] One must recall that under Lucy

[282] Florence Matilda Read, 1961.

Tapley's administration, there was a deliberate effort to expand the physical plant in an effort to offer more college-level courses and petition for college-level status, which the institution did in 1924. However, despite these earlier efforts, Table 4.2 shows that most of the students were not taking college-level courses. As had been the case since Spelman's founding, the majority of students were enrolled in courses at the primary and secondary level, or were pursuing vocational courses that would provide them with a diploma.[283] Read argued that if Spelman were to move beyond its function as a preparatory school, or, in other words, taken seriously as a college, then more emphasis and resources needed to be placed on the college department.

Other, external factors also bore on Read's educational agenda, which she would pursue throughout her nearly thirty-year tenure. These events included the stock market crash of 1929, the ensuing Great Depression (coupled with efforts to spur economic recovery under Franklin Roosevelt's New Deal), and the second World War. As Watson and Gregory correctly note, the Great Depression resulted in decreased job opportunities, particularly those in teaching, and severely diminished the ability of philanthropies to

[283] Brazzell (1992) points out that Spelman was not unusual in its course offerings split among college, high school and elementary levels. The South was slow to put in a public education system for newly freed slaves following Emancipation. Georgia, in particular, was strongly opposed to any form of secondary education for Blacks and as late as 1915, the five largest cities in Georgia, including Atlanta, had no public high schools for Blacks. Johnetta Cross Brazzell, "Brick Without Straw: Missionary-Sponsored Black Higher Education in the Post-Emancipation Era," in *The Journal of Higher Education*, vol. 63, no. 1, Jan. - Feb. 1992.

give at pre-Depression era levels.[284] Given the state of economic arrest under which the nation was suffering, Spelman College, already economically and politically marginalized and heavily dependent upon outside funding which was quickly drying up, simply could not afford to continue to offer both normal and college-level curricula.

Some discussions concerning the elimination of certain departments and program offerings had already been underway well before 1929, but the decision to follow-through was hastened by the country's economic decline and the negative impact on the financial stability of Spelman College. For example, the Board of Trustees had already voted at its May 20, 1927 meeting to discontinue the elementary school, effective at the

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[284] Ibid. Even though Watson and Gregory point to the Great Depression as having an impact on Spelman's curricular offerings, the authors' scant treatment of this major, catastrophic period, particularly on African Americans in the South, is quite curious. Nell Painter (2006) points out that by 1932, more than twenty-five percent of all U.S. workers were unemployed; and for African Americans, the proportion was closer to one-half. Painter further notes that in southern cities, upwards of seventy-five percent of African American families turned to public assistance for relief while the economic crisis and its consequences overwhelmed social resources, including private charities. Given the overwhelming state of unemployment and poverty that was crushing the nation and which had a particularly devastating impact on the already economically marginalized Black population, it's not at all clear from the Watson and Gregory narrative how African American families were able to send and keep their children in college, an expense which could only be viewed as a luxury. It is further not clear how many private Black colleges were able to stay operational, a factor which would be addressed with the establishment of the United Negro College Fund by William D. Patterson in 1944. Surely the impact of the Great Depression on Spelman was much more critical than the one-paragraph reference which Watson and Gregory make and which, even more amazingly, is treated only barely by Florence Read in her history of Spelman College. For a greater discussion of the Great Depression and Roosevelt's Neal Deal policies and programs, see Nell Irvin Painter, *Creating Black Americans: African American History and Its Meanings, 1619 to the Present*, Oxford: Oxford University Press, 2006.

end of the following academic year. At that same meeting, the Board also voted not to admit any new students for the nurse training program or to treat outside patients through the MacVicar Hospital given the institution's inability to keep up with modern medical technology needed to provide appropriate standards of care and training. Finally, in 1930, despite protests to the contrary, the college finally discontinued the high school.[285]

The decision to discontinue nursing (which would be re-instituted in 1959), the elementary school and the high school was met with concern and disappointment by the campus and community alike. MacVicar was the only facility in Atlanta where African Americans could gain access to hospital care and was used by both black and white doctors. However, provisions were made for the existing 17 students to complete their training and receive their diplomas from Spelman or from Hubbard Hospital, a cooperating facility in Tennessee, or to be transferred to other hospitals.

The issue of the impact of the discontinuance of the elementary and high schools exposed issues pertaining to disparities in the quality of and access to public education for African Americans which, more than 50 years after the end of Reconstruction, still continued to plague the South. Per capita expenditures by southern states on public elementary schools for Black children was disproportionately less than those for white children; the school

[285] Florence Read, 1961, pp. 214-215

terms were shorter; the one-room classes were either far distances from student homes (resulting in low attendance rates) or poorly equipped; and Black teachers typically had twice as many students as teachers in white schools.[286] These concerns were not lost on the Spelman Board of Trustees. In 1927, Georgia only had two accredited public high schools for more than 370,000 students.[287] Spelman, therefore, provided access to accredited secondary education, not only to Black youth from Atlanta but to those from other, rural areas in Georgia who were boarders on campus.[288] As compelling as these factors were to continue operation of the high school, the assessment of the financial strain on limited institutional resources, coupled with efforts to increase Spelman's standing as a college, over-rode public sentiment.

The community, however, was not left without recourse. By 1930, Spelman College, Morehouse College and Atlanta University had entered into an agreement of academic affiliation.[289] Signed in April 1929, the agreement enabled the three institutions to maintain their individual status, administration and board of trustees, while taking advantage of the resources that existed collectively between the three campuses.[290] More

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[286] H. Kenneth Bechtel, 1989, pp. 4-6

[287] Read, 1961, p. 215

[288] Ibid.

[289] Ibid, p. 229

[290] Ibid, p. 235

(continued...)

specifically, from the arrangement, the three institutions established and jointly operated for the next twelve years a laboratory high school.[291]

With Spelman no longer focusing on elementary and secondary education, Read could now direct attention and resources on increasing the college-level curriculum. The fairly rigid sequence of required general core courses (see Table 4.3 in this chapter) was modified to include a foreign language requirement, along with a three-hour course in philosophy and a three-hour course in political science.[292] Read also moved to add more electives, a route that the northeastern white women's institutions, such as Wellesley, had taken since the 1880s and which had "become the keystone of the arch of liberal culture. .

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[290](...continued)
The Agreement of Affiliation was actually the brainchild of Wallace Buttrick, Secretary of the Rockefeller-funded General Education Board, and took fruition under John Hope, president of Atlanta University who saw each of the schools eventually uniting as one "great university center." Later, Clark College and Morris Brown College would become part of the consortium, as would the Interdenominational Theological Center, established in 1958, and the Morehouse School of Medicine, established in 1978.

Clark College and Atlanta University would merge in 1988 to form Clark Atlanta University. Morris Brown College would lose its accreditation in 2003 due to heavy financial debt and would simultaneously be stripped of its designation as a historically Black college. The Atlanta University now officially consists of Spelman College, Morehouse College, Clark Atlanta University, the Interdenominational Theological Center and the Morehouse School of Medicine. Nevertheless, the history of one is integrally tied to the history of the others and it is virtually impossible to tell the story of Spelman College without reference to the Atlanta University Center consortium. The affiliation would establish a precedent for other cooperative arrangements among U.S. colleges, the Claremont Colleges in California amongst them.

[291] Watson and Gregory, 2005, pp. 117-119

[292] Ibid, p. 306

."[293] This specifically included courses in the so-called classics, such as Greek civilization, language and literature. Additional courses were also added in music, psychology, literary criticism and philosophy. There was no push to increase the focus on science.

Read also worked to increase the size of the faculty body, but noted that while the doctoral degree was respected, it did not take precedence over other qualifications, such as knowledge of and zest for the field and an enthusiastic approach to teach and interact with students.[294] Read's assessment that possession of the doctorate was not a primary consideration in recruiting and hiring faculty is curious. Perhaps it is based on the fact that she, herself, did not possess the doctoral degree.[295] Perhaps Read's position reveals that Spelman simply did not have the resources to compete with other women's institutions, certainly those in the northeast, where by the 1890s and early 1900s, doctorates were a standard requirement.[296] Of the eight faculty appointments Read credits to her administration, only three were in science disciplines – Helen Albro and Anna Grace Newell, both in biology, and Georgia Caldwell Smith, an African American,

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[293] as cited in Watson and Gregory, 2005, p. 55

[294] Read, 1961, p. 306

[295] According to institutional records, Read's highest academic degree was the literary doctorate. *Spelman College Bulletin*, 1959-1960

[296] Rossiter, 1982, p. 15

in mathematics.[297]

In 1930, Spelman was elected to membership in the Association of American Colleges, becoming one of only six HBCUs among the organizations then 400 members.[298] Two years later, the Southern Association of Colleges and Secondary Schools, the accrediting body, voted to give “Class A” rating to Spelman, which meant that the credits and degrees conferred by Spelman would be accepted by institutions to which Spelman graduates might attend for advanced study.[299] It would take another seventeen years before the Association of American Universities, an organization of graduate schools, voted to place Spelman on the list of approved institutions whose graduates are admitted to member institutions of the Association.[300]

Florence Read resigned the Spelman presidency in 1953, having served 26 years. Scholars and alumnae have described curricular changes associated with her tenure as “the most forward-thinking and liberal of those implemented at the institution since its

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[297] Ibid.

[298] In addition to Spelman College, the other five HBCUs included Howard University (Washington, D.C.); Lincoln University (Chester, Penn.); Fisk University (Nashville, Tenn.); Wilberforce University (Wilberforce, Ohio); and Morehouse College (Atlanta, Georgia). Florence Matilda Read, *The Story of Spelman College*, Princeton, NJ: Princeton, Princeton Univ. Press, 1961, p. 241.

[299] Read, 1961, p. 241, 322

[300] Ibid,

humble beginnings."[301] Reference is often made to increased efforts to strengthen the college-level curriculum; the agreement of academic affiliation between Spelman, Morehouse and Atlanta University which opened up further educational opportunities for students while advancing Spelman's standing with accrediting bodies; the increased diversity of Spelman faculty, with respect to both race and gender;[302] and the increase in curricular and co-curricular offerings in the arts which flourished between 1935 and 1959.[303] Few, however, point to Read's efforts in establishing and building Spelman's endowment, and raising alumnae awareness of the need to make regular and annual financial contributions to the institution – all during the greatest period of economic devastation the country had ever known. By Read's own assessment, her greatest influence on Spelman's curricular and co-curricular offerings was in the arts, despite having led the institution before, during and after World War II when national rhetoric

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[301] Watson and Gregory, 2005, p. 128 Similar assessments were made by Trevor Arnett, president of the Spelman Board of Trustees in 1953, as well as students and faculty. See Trevor Arnett, "A Testimonial to the Devotion and Labor of Miss Read," in the *Spelman Messenger*, August, 1953, vol. 69. No. 4

[302] By 1937, Blacks were at least twice the number of whites and by 1952, there were three times as many Black as white faculty. With respect to gender, women had always outnumbered men faculty. In 1926, a year before Read arrived at Spelman, the college had no men faculty. Read appointed two during her first year and there were 12 a decade later. See Guy-Sheftall and Stewart, *Spelman: A Centennial Celebration*, 1981, p. 55.

[303] For a greater account of Spelman's "cultural awakening" during this period, see Guy-Sheftall and Stewart, 1981.

and policies were focused on science.[304]

Spelman's First African American President:

Albert E. Manley

In 1953, Spelman appointed its first male and first African American president, Albert Edward Manley. The son of Jamaican immigrants, Manley was familiar with historically Black institutions. He had graduated in 1930 from Johnson C. Smith University, an HBCU in Charlotte, North Carolina. Before going to Spelman, Manley served as dean of North Carolina College (now North Carolina Central University). At NCC, Manley's "views about the importance of a challenging education were reinforced," centering on the notion that "the main purpose of a liberal arts education is to develop the ability of students to think creatively and carefully about ways to deal with social injustice."[305] Manley brought this philosophy of motivating students and an urge to improve the educational programming to Spelman College.

When Albert Manley took office in 1953, Spelman had grown phenomenally since its founding but was still politically and economically marginalized. The college's twenty-acre campus, consisting of 17 buildings, was safely removed and, for the most part, invisible to the white community. Howard Zinn (1994), a white historian who held his

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[304] Florence Matilda Read, 1961.

[305] Albert E. Manley. *A Legacy Continues: The Manley Years at Spelman College, 1953-1976.* Lanham, MD: Univ. Press of America, 1995, pp. 13-14

first full-time appointment at Spelman College, describes his initial experiences in segregated Atlanta after relocating there from New York.[306] "If black people were downtown," Zinn observed, "it was because they were working for whites, or shopping at Rich's Department Stores, where both races could come to buy but the cafeteria was for whites only."[307]

The segregationist reality of Atlanta was no stranger to the 439 students enrolled at Spelman during the 1953-54 academic year. More than ninety percent came from Georgia and neighboring southern states, including Alabama, Florida, the Carolinas, Mississippi and Tennessee.[308] Some were daughters of middle-class teachers, ministers and small business owners, while others were from more humble parentage -- maids, laborers and tenant farmers.[309] SAT scores were not an admission's criteria (and would not be so until the mid-1960s), so selection was basically limited to high school academic performance and personal statements.[310]

During the 1953-54 academic year, only 10 of Spelman's 48 permanent faculty members

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[306] Howard Zinn, *You Can't Be Neutral on a Moving Train*, Boston, Mass.: Beacon Press.

[307] Ibid, p. 18

[308] *Spelman College Bulletin*, 27-30, No. 1 (April, 1954).

[309] Howard Zinn, 1994.

[310] Albert Manley, 1995, p. 73

(twenty percent) held the doctoral degree, and three of these individuals, though listed as faculty, were clearly administrative, including Albert Manley, the president, Florence Read, president emeritus, and Audrey Miller, the assistant registrar.[311] While the student-faculty ratio of 12 to 1 was impressive, the college's administrative infrastructure was minimalist. It included a president, the dean of women, the registrar, the treasurer, an assistant treasurer, a librarian, and the superintendent of buildings and grounds – all if whom were supported by nine secretaries and assistants.[312]

The college's endowment of $3.6 million in 1953 surpassed many other HBCUs and dwarfed the $100 that the institution's co-founders, Packard and Giles, managed to raise from their sponsoring organization, the WABMHS, during the post-Reconstruction

[311] This figure does not include the four teachers in the nursery school, none of whom held advanced degrees; nor does the figure reflect an additional eight exchange faculty, of which four held the doctoral degree. The 10 permanent Spelman faculty members with the doctoral degree included Helen Albro, Alberta Seaton, and Barnett Smith, each in biology; Oran Eagleson in education and psychology, Cora-Greene Johnstone in English; Wallace McAfee in religion; and Cornelia Paustian in history. Also listed among the faculty but whose positions were primarily administrative included Audrey Miller, the assistant registrar; Albert Manley, the president, and Florence Read, president emeritus. *Spelman College Bulletin*, 1953-54.

[312] Albert Manley, 1995. The college also had a 15-member Board of Trustees to which the president reported. At the time of Albert Manley's appointment, the Board consisted of twelve men and three women. Of the group, eleven where white, four were Black and there was no faculty or student representation. The Board met twice annually and considered its primary role to hold the college's fiduciary trust and continue to foster Spelman's growth as a liberal arts college of great significance

period.[313] Spelman fared better than other HBCUs, which, according to the U.S. Department of Education, had no or small endowments to serve as buffers in times of financial distress.[314] The $3.6 million figure, as large as it may have seemed in the HBCU community, paled in comparison to other women's college. Mount Holyoke in Massachusetts, for example, had an endowment valued at $28.7 million in 1950.[315]

Spelman's aim and its core curriculum had been relatively stable since 1928, a year following the institution's formal designation as a liberal arts college. Spelman sought to "provide, within a limited scope and with a relatively small number of students, as good educational facilities as are available in any college of liberal arts."[316] By limited scope, this meant a focus "on courses in fundamental subjects in the humanities, science, languages, and fine arts," that "go hand in hand with practical application of knowledge; straight, courageous thinking with honesty, clean living, thorough-going mastery of the task in hand. . . "[317]

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313 Florence Read, 1961, p. 213

314 U.S. Department of Education, National Center for Education Statistics, *The Traditionally Black Institutions of Higher Education, 1860 to 1982,* Washington, D.C.: April, 1985.

315 Albert E. Manley, 1961, p. 81

316 Spelman College Course Catalog (1928-1929), Spelman College Archives

317 Ibid

Table 4.3
Spelman College General Curriculum, 1953-54

Freshman Class	Sophomore Class
Biology 101-102	Education 204
English 101-102	English 211-212
History 111-112	History 211-212
Speech 101-102	or
Health and Personality Dev. 107	Religion 211-212
Individual Guidance 108	Psychology 201
One Elective	One or Two Electives
Physical Education	Physical Education
Junior Class	**Senior Class**
History 211-212	Philosophy 305-311
or	Major Subject
Religion 211-212	Electives
Political Science 201 or 307-308	Physical Education
Major Subject	
Electives	
Physical Education	

Source: *Spelman College Bulletin*, 1953-54, Spelman College Archives, Atlanta, GA

Manley was particularly concerned with the general core curriculum, which he described as a model for that time, but, as reflected in Table 4.3, was structurally rigid, out of touch with the world outside the campus, and left little room for the type of exploration usually associated with the liberal arts.[318] Students could select from 14 majors, including art, biology, chemistry, economics, English, French, history, political science, home economics (the only subject for which students were awarded the Bachelor of Science

[318] Manley, 1995.

degree), mathematics, music, psychology, social science, and Spanish. Using the number of seniors as an indicator, the most populous major in 1953 was English with 19, followed by music and home economics with nine each. Psychology was the choice of only two seniors. This trend would change dramatically in subsequent decades, with the social sciences (which included history), and later psychology specifically emerging as the most popular majors. Most often, students paired their core major with a teacher certification, as teaching was one of the few careers open to Black women at that time.[319]

Manley's own observations and efforts to re-shape Spelman's dated curriculum were echoed by faculty and the Board of Trustees. The Trustees focused on expanding Spelman from a regional to a national college, while faculty took issue with the college's Statement of Aims and Ideals. Relatively unchanged since 1927, faculty viewed the statement as ethical idealism and inadequate in addressing the academic aims of the college.[320] Among faculty concerns was the lack of attention to specific student learning outcomes and the inflexibility of the educational program which, contrary to the philosophical underpinning of liberal learning, did not provide opportunities for student intellectual exploration and experimentation.[321]

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[319] Albert Manley, 1995, p. 75

[320] *Spelman College Self-Study Report*, 1968

[321] Ibid, p. 17

One of the first tasks that Manley undertook shortly after his appointment was a request that chairpersons submit reports assessing the current status of their departments and outlining future goals and objectives.[322]

The exercise was a useful one, and the reports would later form the basis for several curricular changes, including the addition in 1955 of a major in health, physical education and recreation, with a specialization in teacher education.[323] Despite these initial efforts, Manley could not successfully lead the college through one of the most important moment's in its history – accreditation by the Southern Association of Colleges and Schools (SACS). The decision by SACS to deny the application was based on the lack of doctoral or other terminal degrees by faculty in the music, art, French and home economics departments, as well as insufficient student testing and inadequate tutoring services.[324]

The SACS decision was personally devastating to Manley, but after a year's probation, Spelman was awarded accreditation.[325] Also in 1956, chemistry and economics became course offerings with major and minor programs. Three years later, Spelman re-

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[322] Ibid, p. 36

[323] Ibid.

[324] Ibid, p. 37

[325] Ibid.

introduced nurse training through a cooperative program with Grady Memorial Hospital.[326]

Manley's focus on curricular change also included the appointment of a curriculum committee in 1956 to make further changes and modifications. However, when one compares the general curriculum of 1953 (Table 4.3) with the general curriculum for 1959 (Table 4.4), the changes were quite limited. The speech requirement was moved from the freshman year to the junior year, while "Health and Personality Development" and "Individual Guidance" were removed altogether. Another course, "Elements of Math," also became a requirement.

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[326] Ibid, p. 40

Table 4.4
Spelman College General Curriculum, 1959-60

Freshman Class	Sophomore Class
Biology 101-102: General Biology	English 211-212: Western Literature
English 101-102	History 211-212: American History
History 111-112: Western Civilization	or
Education 103: Freshman Orientation	Religion 211: Old Testament Lit. & Hist.
Physical Education	Religion 212: Life of Christ
One Elective	One or Two Electives
	Physical Education
Junior Class	**Senior Class**
History 211-212	Philosophy 305: Ethics or
or	Philosophy 311: Intro to Philosophy
Religion 211-212	Major Subjects
Mathematics 103: Elements of Math	Physical Education
Political Science 201: U.S. National Government	
Speech 103: Fundamentals of Speech	
Physical Education	

Source: Spelman College Catalog, 1959-60, Spelman College Archives, Atlanta, GA

Social Upheavals and Newfound Sensibilities

Efforts to address the college's failure to secure initial accreditation by SACS would prove simpler than other social, educational, racial and judicial complexities associated with the 1950s and later. One must recall that Manley had assumed his administration in the midst of a post-WWII economy that heavily favored the sciences. Manley's appointment as president of Spelman also coincided with a stream of Supreme Court decisions, culminating in *Brown versus Board of Education* in 1954, questioned the notion of separate but equal, and a burgeoning Civil Rights movement had sprung from grassroots efforts right there in the South.

Spelman was not immune to such broader forces. Manley would have to contend with growing organizing efforts among students who challenged what former Spelman history professor Howard Zinn described as the "tightly controlled atmosphere of Spelman College, where they [students] were expected to dress a certain way, walk a certain way, pour tea a certain way."[327] The polite decorum, however, belied a growing consciousness, particularly among the students, that Spelman needed to be actively involved in changing the world around them.[328] This "new breed" of Spelman women responded that the curriculum should be more relevant to Black people; major and minor offerings should be broadened; and that areas of concentration should be added to enable more vocational choices.[329]

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[327] Howard Zinn, 1994, p. 18

[328] In addition to organizing for equity and access for disenfranchised African Americans, civil rights activists also began to question the relevancy of the curriculum, which many educators described as Eurocentric and devoid of the contributions of African Americans. Vincent Harding, chair of the history department at Spelman in 1960, "urged that black colleges explore and celebrate the history and culture of the non-Western world, especially those of black Africans and their descendants in the diaspora." As quoted in Albert Manley, 1995, p. 45. Harding who, after leaving Spelman, directed several non-profit organizations before joining the faculty at the Iliff School of Theology at the University of Denver in Colorado, would eventually publish *There is a River*, a history of slavery in America written from the perspective that the enslavement of African descendent peoples in America has always been characterized by efforts to achieve liberation and dignity. See Vincent Harding, *There is a River: The Black Struggle for Freedom in America* , New York: Random House, 1981

[329] Ibid, p. 19

Albert Manley was caught up in this newfound sensibility that was transforming the College from what had been its traditional cultural grain of educating polite young women who attended to home, community, and the uplift of their race. Manley was also pressured by external influences that had similarly impacted the college's founders, Packard and Giles, about what Spelman should be. Albert Manley would be influenced by each of these factors; yet, nothing would affect him more personally than the efforts of three women on the Spelman College campus who, as early pioneers in science and health, openly questioned Spelman's commitment to educating African American women in science.

Chapter Conclusion

Support for the sciences flourished during the post-World War II period but questions began to arise regarding the country's science and technological superiority following the Soviet launch of *Sputnik*. Experts pointed to a weak educational system and the need to educate more and better-trained scientists and engineers – irrespective of gender. By 1960, the U.S. had nearly doubled the number of women scientists trained at the doctoral level since the end of World War II as compared to the total number of women earning doctoral degrees in science up to that time. The growth of women's colleges and the change in their course offerings, from the ornamental to subjects at a par with the men's institutions, provided what Rossiter describes as an "entering wedge" for women to study science systematically.

The growth in the number of women scientists, however, masked the challenges women faced and failed to underscore disparities in the number and rate of degree production based on race and region. The number of Black women with the Ph.D. in science was a mere 58 by 1969, and similar to the higher education of African Americans generally, the historically Black college would be responsible for the largest percentage of degree production. Spelman College, one of only three surviving single-sex historically Black institutions for women, tied as the second-leading baccalaureate-origin institution for Black women Ph.D. recipients, accounting for four of the 58 Black women science doctorates.

In 1953, Spelman was, by any measure, a small and politically and economically marginalized institution – less than 500 students, most from Atlanta and rural towns in Georgia, and a faculty body in which less than one percent held the doctoral degree. The college's place in 1953 as the second-leading baccalaureate-origin institution for African American female science doctoral recipients (tied with Tuskegee University in Alabama) was a by-product of circumstance, not any deliberate plan by its faculty and administrators. The institution was originally established in the post-Reconstruction period as a seminary for former slave women and girls to teach them to read and write, perform basic arithmetic, become teachers, missionaries, homemakers and contribute to the basic uplift of the race.   The institution's focus and curricular offerings would be influenced as much by external societal factors that held pre-defined notions of what Black women should and ought to be as by the vision and efforts of its first four white female presidents – Sophia Packard, Harriet Giles, Lucy Hale Tapley, and Florence Matilda Read.

Spelman's first four presidents took their cues from the larger philosophies of missionary-sponsored women's education. The ways in which that philosophy would play out when talking about a woman's college, in the segregated South, for Black females, bore extreme importance for Spelman's curricular offerings from 1881 through 1953. For Packard and Giles, life-long partners who made the journey south to co-found Spelman, the emphasis on educating chaste women, as evidenced by the school's early motto, "Our Whole School for Christ," far outweighed similar foci in the northeastern women's colleges which also stressed the need to educate women for their proper spheres in the home as wife and mother but later shifted from ornamental subjects to provide students with college-level curricula. As early as the 1880s, the older, northeastern white women's colleges, such as Bryn Mawr in Pennsylvania, emphasized the importance of the sciences, consciously created a climate and culture conducive to educating women in science, and continued to emphasize the sciences well into the twentieth century.

The route to higher education for Black women took a different trajectory. Society questioned whether Black women should be educated, provided scarce resources when the need to educate African American women was finally acknowledged, and required that Black females carry the burden to uplift and improve the race. Education for education's sake was deemed impractical. Instead, society, and the philanthropists needed to support the effort, encouraged more practical subjects. Large vocational and professional departments began to emerge on Black women's college campuses seeking to train Black female teachers, nurses and domestic workers. Spelman College fit squarely within these debates and its curricular offerings undergirded what society deemed appropriate. Spelman's vocational focus would become particularly pronounced during the seventeen-year administration of Spelman's third permanent president, Lucy Hale Tapley, from 1910 through 1927.

While the issue of practical utility of education for women would cross the racial divide, particularly in the south, differences began to emerge between Black and white women's colleges in the number of elective courses available to students. White women's colleges such as Wellesley in Massachusetts made such electives available to their students since the 1880s, but it would take another 40 years before significant numbers of elective courses were offered at Black colleges.

By the time Florence Matilda Read took office in 1927, Spelman had grown phenomenally, but the institution had graduated only 62 students with the bachelor's degree – despite having been chartered the right to do so since 1901. The majority of Spelman students were enrolled in courses at the primary and secondary level, or were pursuing vocational courses that would provide them with a diploma. Leading Spelman through the Great Depression and World War II, Read's legacy to Spelman would be to further facilitate the institution's transition as a liberal arts college. This meant eliminating the elementary and high schools, along with the nurse training program. To Read's credit, the graduate of Mount Holyoke established an endowment, an articulation agreement of affiliation with Morehouse College and Atlanta University, and increased curricular and co-curricular programs in the arts. Despite boosterism and federal support for science education as ushered in by the war and strained relations with the Soviet Union, Florence Read did not make science a focus of her administration.

When Spelman appointed its first African American male president in 1953, he continued efforts to move Spelman from a regional to a national institution and to put in place a core curriculum that was aligned with the philosophy of liberal learning. A failed attempt to secure accreditation by SACS was met by a year's probation, moderate changes to the general curriculum, and the re-introduction of nursing. Albert Manley, himself the product of an HBCU, assumed his administration in the midst of a post-WWII economy which heavily favored the sciences, a landmark *Brown versus Board of Education* Supreme Court decision in 1954 which deemed separate was not equal, and a burgeoning Civil Rights movement that sprung from grassroots efforts right there in the South. Faculty who occupied Tapley Hall, the main science facility, had their own demands – to create an environment that could seriously attract and graduate more African American women in science.

CHAPTER 5

THE 1960s AND 1970s:

BUILDING A PROGRAM FOR

AFRICAN AMERICAN WOMEN IN SCIENCE

> For Etta Falconer, the notion of establishing a science program for young, African American females was quite simple – she wanted to provide students with a nurturing environment with mentors and role models because 'basically, we were people who went to school with none.'
>
> Etta Z. Falconer, 1999

If the 1950s were characterized by science boosterism, then the 1960s and 1970s exposed a crisis in the public image of science. Opponents of the Vietnam War appealed to the public's moral sensibility and staged campus protests regarding the use of Agent Orange and Napalm bombs, both products of science, on innocent women and children.[330] Rachel Carson's *Silent Spring* sounded the alarm about the harmful effects of the pesticide DDT on the environment, and precipitated a larger debate on science regulatory

[330] James West Davidson, et. al. *Nation of Nations: A Concise Narrative of the American Republic, Volume Two: Since 1865*, Boston: McGraw Hill, 1999.

controls, social responsibility and public participation in science policy formulation and establishing research agendas.[331]

Public perceptions and criticisms about the uses of science and unchecked balances of power were compounded by concerns about *who* got to participate in the scientific enterprise, the *nature* of that participation, and the *equitable* distribution of public resources. Women, in particular, began to challenge arguments that science was universalistic in its reward and recognition of talent and the distribution of resources. Adopting the rhetoric and strategies of civil rights activists, they framed their arguments in terms of discrimination, equality and access and openly questioned the low percentage of female scientists entering and advancing in the profession. In her widely publicized 1965 article, “Women in Science: Why So Few?,” the sociologist Alice Rossi openly criticized science institutions for a pattern that revealed fewer women in science at every successive level, and indicted society as a whole.[332] “Everyone expected them to drop

[331] Rachel Carson, *Silent Spring* (Houghton Mifflin, 1962). For an expanded discussion regarding misconduct in science and the move for greater public participation, see William Broad and Nicholas Wade. *Betrayers of the Truth*. New York: Simon and Schuster, [1983] c1982; David Dickson and David Noble, “Antidemocratic Science: The New Corporate Technocrats,” in *The Nation*, vol. 233, no. 193, (1981), 208-212; Richard Sclove, *Democracy and Technology*, (New York: Guilford Press, c1995); and Steven Epstein, *Impure science : AIDS, Activism, and the Politics of Knowledge*, (Berkeley : University of California Press, c1996).

[332] See Alice S. Rossi, “Women in Science: Why so Few?” *Science* 148 (1965): 1196-1202; see also Alice S. Rossi, “Barriers to the Career Choice of Engineering, Medicine or Science among American Women,” in Mattfeld and Van Aken. *Women and the Scientific Professions*, 51-127.

out," writes Rossi, "felt more comfortable when they did, and even planned for it."[333] Even Executive Order 11375, signed by President Johnson in 1967 to ban racial and sexual discrimination by federal contractors, did little to change institutional patterns of sexually discriminatory behavior.[334] It would take another five years to effect change through the Equal Employment Opportunity Act of 1972 and the Education Amendments Act of that same year. Enacted under President Nixon, the Equal Employment Act of 1972 succeeded in dropping that portion of Title VII which exempted all educational institutions from equal employment opportunity laws.[335] The Educational Amendments Act included a Title IX provision which extended the Equal Pay Act of 1963 to higher education and banned sex discrimination in any program of an institution receiving federal funding.[336]

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[333] Margaret W. Rossiter, 1995, p. 367

[334] Ibid, p. 375.

[335] Ibid, p. 376

[336] Public Law 92-318, *U.S. Statutes at Large* 86 (1972); 373-75; and *Higher Education Amendments of 1971: Hearings before the Subcommittee on Education of the Committee on education and Labor, House of Representatives, 92nd Congress, 1st Session* (Washington, D.C.: GPO, 1971), as cited in Margaret W. Rossiter, 1995, p. 362. It is also worthy to note that Title IX of the Higher Education Amendments were expanded to include recommendations as outlined by the U.S. Commission on Civil Rights in 2000 and he Government Accountability Office (GAO) in 2004 to specifically focus on the participation of girls in STEM. In 2004, the GAO issued the report, "GENDER ISSUES: Women's Participation in the Sciences Has Increased, but Agencies Need to Do More to Ensure Compliance with Title IX." (See http://www.gao.gov/htext/do4639.html) [Accessed 10 July 2006].

Margaret Rossiter (1995) provides one of the most detailed accounts of feminist mobilization during the 1960s and early 1970s to push for legislative reform to combat what was identified as structural problems that limited women's access to and advancement in the profession.[337] Rossiter points to sustained patterns of discrimination that accounted for the invisibility of women in science prior to efforts to achieve parity, resulting in the affirmative action legislation of the 1970s.[338] The Rossiter narrative, however, is less probative about the experiences of African American or other women scientists of color and efforts by these groups to increase their representation in science and achieve parity.

Shirley Malcom (1993) notes that African American women and other women of color were not silent during the 1970s period of feminist mobilization but "found little that spoke specifically to their particular needs."[339] Black women scientists sought to raise

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[337] Margaret W. Rossiter, 1995

[338] Ibid.

[339] Shirley Malcom, "Increasing the Participation of Black Women in Science and Technology," in Sandra Harding (ed.) *The 'Racial' Economy of Science: Toward a Democratic Future*, (Indiana Univ. Press, 1993). This perception of the incongruence of interests and needs punctuates a larger divide that historically has existed between white and Black women feminists in the struggle for political and economic parity. For a larger discussion about the roles and contributions of Black women to feminism, see Johnnetta B. Cole and Beverly Guy-Sheftall. *Gender Talk: The Struggle for Women's Equality in African American Communities.* New York: Ballantine, 2003; bell hook., *Ain't I a Woman: Black Women and Feminism*. Boston: South End Press, 1981; Patricia Hill Collins. *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment.* New York: Routledge, 2000 and *Fighting Words: Black Women and the*
(continued...)

awareness about their experiences, increase access and ensure parity. In a later study, Diann Jordan (2006) notes that most of the 17 African American female scientists she interviewed indicated that the civil rights movement was significant – even if did not directly affect their advancement in science – but did not identify with the 1970s wave of what they perceived to be a white-women-only movement or view the women's movement as having made an appreciable difference in their professional lives.[340]

This sentiment is not new or unknown. Bernstein and Cock (1994) note that issues of race, class and other characteristics are subjugated when discussions focus on women.[341] Instead, the underlying assumption is that the experiences of white women should stand as a legitimate and universal subject of analysis. Sue Rosser (2000) has warned against homogenizing the experiences of women, writing that:

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[339](...continued) *Search for Justice*. Minneapolis: Univ. of Minnesota Press, 1998; and *Still Lifting, Still Climbing; African American Women's Contemporary Activism*. New York: New York Univ. Press, 1999; Beverly Guy-Sheftall. *Words of Fire: An Anthology of African American Feminist Thought.* New York: New Press, 1995; and "Other Mothers of Women's Studies," in Florence Howe (ed.). *The Politics of Women's Studies: Testimony from Thirty Founding Mothers*. New York: Feminist Press, 2000; Sheila Radford-Hill. *Further to Fly: Black Women and the Politics of Empowerment.* Minneapolis: Univ. of Minnesota press, 2000.

[340] Diann Jordan. *Sisters in Science: Conversations with Black Women Scientists on Race, Gender, and Their Passion for Science.* Indiana: Purdue University Press, 2006.

[341] A. Bernstein and J. Cock, "A Troubling Picture of Gender Equity," in *The Chronicle of Higher Education*, June 15, 1994, pp. 1-3

> Just as women's studies scholars revealed that the assumption that male experience coincided with human experience constituted a form of androcentric bias that rendered women invisible and distorted many research results, these same scholars mistakenly assumed that the experience of all women was the same. Women of color, working-class women, and lesbians pointed out that their experiences as women and as scientists did not fit the depictions that emanated from a white, middle-class, heterosexual perspective. This revelation led to the recognition that gender did not represent a homogenous category of analysis. . . [342]

Jewel Plummer Cobb, an early Black female pioneer in science who earned the doctoral degree in physiology from New York University in 1950 and became president of California State University at Fullerton in 1981, parlayed her professional status to effect change. Cobb worked with the American Association for the Advancement of Science (AAAS) to organize a conference in 1975 specifically focused on the needs of minority women in science and engineering. The resulting conference proceedings, *The Double Bind: The Price of Being a Minority Woman in Science*, increased the visibility of issues unique to minority women. "The more an individual resembles the 'typical scientist' the lower are his costs," Malcom reflected in her essay for the 1976 conference

[342] Sue V. Rosser, "Building Inclusive Science," *Women's Studies Quarterly*, vol. 28, Nos. 1 and 2, Spring/Summer 2000, p. 8

proceedings.[343] For women of color, the costs of "their differentness" came in the form of great personal sacrifice. Malcom further reflected that "the scarcity of companions of their own racial or ethnic group and gender, progressively greater as the degree of specialization in science increased, was a source of isolation and loneliness."[344]

Activism at Spelman College:

The Push for Curriculum Transformation and Institutional Reform

While the nation was increasingly grappling with civil rights in terms of equity and parity for African Americans and for women, at Spelman College, the question of race seemed more urgent and was embedded in a larger debate about institutional reform. At issue was the seemingly apolitical image and role of the institution – despite a southern-based Civil Rights Movement which was growing more agitated and impatient in its student-led organizing efforts to engage in direct action.

The debate about Spelman's image and role had its genesis in the 1950s, but would reach higher levels as a result of student civil rights activism of the 1960s that had been

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[343] Shirley Malcom, 1993, p. 250 Malcom identifies additional organizing activities that Black women scientists undertook to raise awareness, increase K-12 recruitment efforts, and develop networks of support among other Black women scientists in order to decrease the isolation of being "the only." Some of those efforts included the formation of the National Network of Minority Women in Science in 1978 and a grant from the U.S. Department in Education in 1981 to develop career booklets to increase awareness among African American and other racial minority young women and girls about careers in science.

[344] Ibid.

sweeping college campuses across the South. Spelman students had already operated outside of their "gender scripts" as polite and apolitical by collaborating with other students in the Atlanta University Center in protest of Atlanta's discriminatory and segregationist policies. They began by making an appeal for Human Rights, which appeared on March 9, 1960 as a full-paged advertisement in the local newspaper.[345] A week later, 200 students from the Center staged sit-ins at nine public buildings. Seventy-seven students were arrested. A meeting of the Student Non-Violent Coordinating Committee (SNCC), a student-led organization which grew out of the student lunch counter sit-ins in Greensboro, North Carolina in 1960, sparked further demonstrations and arrests. Fifty-two students from the Center joined the Rev. Dr. Martin Luther King, Jr. at a lunch counter sit-in of Rich's, a local department store, on October 19, 1960.[346] Among the 51 student demonstrators that were arrested with King, 21 were from Spelman College.[347]

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[345] "An Appeal for Human Rights," paid advertisement in *The Atlanta Constitution*, March 9, 1960, p. 13

[346] *Atlanta Constitution*, 20 October 1960, p. 1

[347] For a larger discussion of the participation of Spelman College faculty and students in the civil rights movement, see Harry G. Lefever, *Undaunted by the Fight: Spelman College and the Civil Rights Movement, 1957-1967*, Macon, Georgia; Mercer University Press, 2005 Lefever, a white faculty member who taught sociology at Spelman from 1966-2004, argues that the participation of Spelman student and faculty in the civil rights movement represented a continuity of the college's focus on service and was consistent with the idea that liberal learning must be put into practice. At the same time, the stance that Spelman students took, so publicly captured in their appeal for human rights advertisement in the *Atlanta Constitution* newspaper in March, 1960 was also a break with Spelman's traditional nonpolitical stance. Lefever writes that, "these
(continued...)

Using similar civil disobedience strategies, in 1969, the students staged a 29-hour lock-in of the board of trustees at neighboring Morehouse College. Influenced by slogans of "black is beautiful," the students wanted to change the name of the Atlanta University Center consortium of colleges to Martin Luther King University. They also wanted a voice in how the institutions were administered.[348] The request for the name change was ultimately rejected. Instead, Spelman responded with the formation of a committee on policy matters related to the curriculum, student life, and finances. Students were represented on the committee, which, according to Albert Manley, resulted in curricular changes, such as "a realignment in natural science subjects in connection with the new emphasis on careers in medicine or allied health fields."[349]

Manley may have ascribed more agency to this committee than was the reality of his own efforts, the failure of the college to receive accreditation in 1955 by SACS, growing criticisms by faculty that the rigidity of the academic program were inconsistent with the philosophy of liberal learning, and a deliberate effort by the Board of Trustees to expand

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[347](...continued)
[faculty and student] activists challenged the assumption that social changes should occur gradually and only within established legal institutions," but that " for the first time in the eighty-plus years of Spelman's existence, the students and faculty who participated in the movement took actions that directly challenged the injustices of the social and political status quo." Ibid, p. ii.

[348] Margaret Shannon, "The Liberation of Spelman College," in *The Atlanta Journal and Constitution Magazine*, July 8, 1973. p. 11

[349] Ibid.

Spelman from a regional to a national college.[350] When students were polled, their observations were similar to faculty while also reflecting a growing national sentiment to offer courses in Black studies.[351] Students responded that the curriculum should be more relevant to Black people; major and minor offerings should be broadened; and that areas of concentration should be added to enable more vocational choices.[352]

There was also the issue of Spelman's image and efforts to expand from a regional college to one that was national in focus.[353] With the general core curriculum focusing on courses such as "Personality Development," Spelman was perceived as a finishing school and little had been done (or permitted) to change that perception or the reality of its existence prior to Manley's appointment. However, in order to attract a wider range

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[350] See Chapter 4 for full discussion of curriculum transformation efforts in the 1950s.

[351] In addition to organizing for equity and access for disenfranchised African Americans, civil rights activists also began to question the relevancy of the curriculum, which many educators described as Eurocentric and devoid of the contributions of African Americans. Vincent Harding, chair of the history department at Spelman in 1960, "urged that black colleges explore and celebrate the history and culture of the non-Western world, especially those of black Africans and their descendants in the diaspora." As quoted in Albert Manley, 1995, p. 45. Harding who, after leaving Spelman, directed several non-profit organizations before joining the faculty at the Iliff School of Theology at the University of Denver in Colorado, would eventually publish *There is a River*, a history of slavery in America written from the perspective that the enslavement of African descendent peoples in America has always been characterized by efforts to achieve liberation and dignity. See Vincent Harding, *There is a River: The Black Struggle for Freedom in America* , New York: Random House, 1981

[352] Ibid, p. 19

[353] *Spelman College Self-Study Report*, 1968

of students from outside the South – given that the *Brown versus Board of Education* decision of 1954 now provided African American students with wider college options – meant that Spelman had to be perceived as a credible liberal arts college at a par with other women's institutions.

The limits of public perception were captured in an article appearing in the local Atlanta newspaper in 1972. Entitled "The Liberation of Spelman College," the article focused on the transformation of Spelman from its role as a finishing school to one where students were pursuing careers outside of scripts based on race and gender.[354] Commenting in the article, Judy Gebre-Hewitt, an administrator at Spelman, argued that "all women's colleges, black or white, carry the stigma of being finishing schools." [355] In that same article, the president of Spelman, Albert Manley, fully acknowledged how the finishing school focus informed co-curricular programming. "When girls came [sic] here from Soso, Miss., and other rural communities," Manley told the reporter, "they had to learn how to set a table or maybe even how to use a knife and fork and how to dress properly – the kind of behavior proper for a young lady."[356] The challenge, however, in comparing the shared focus on grooming young ladies for their proper spheres that was common to all women's colleges is that Spelman, unlike northeastern women's colleges, held onto

[354] Margaret Shannon, 1973.

[355] Ibid, p. 11.

[356] Ibid.

that part of its co-curricular activities long after the emphasis on ornamental subjects had been rejected by northeastern women's colleges in place of a college-level curricula. [357] The observation also fails to acknowledge external pressures placed on Spelman to educate properly Black women which was never a part of the history of white women's institutions.

As outlined in Chapter 4, Manley used the first several years of his presidency in the 1950s to work with faculty to assess the curricular offerings and begin a plan of change, which included minor modifications to the general core curricular requirements and the addition in 1955 of a major in health, physical education and recreation, with a specialization in teacher education. Whether one attributes this push for curricular and institutional transformation to the natural progression of time or to that brief period in Spelman's history when students, influenced by wider social upheavals, were the major catalyst, changes did occur. In 1954, a year after Albert Manley's appointment as president, Spelman had an enrollment of 454 students, more than ninety percent of whom came from Georgia and neighboring southern states.[358] By 1964, student enrollment had increased by more than sixty percent to 727 students, though the college still had not

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[357] See previous chapter in this dissertation for a fuller discussion of the transformation of the curricular offerings of northeastern women's institutions.

[358] *Spelman College Bulletin*, 1953-54.

succeeded in attracting a national student body.[359] And with 1,110 of the institution's 1,980 living alumnae employed as teachers (fifty-six percent), the majority of Spelman women were still, as the 1968 Self-Study Committee argued, being "forced to pursue [the only] careers which were open to Negro women. . ."[360]

Despite the continued focus on teacher training, there was progress in other areas of the college. Between 1953 and 1964, the number of volumes in the Spelman library and the college's operating budget had both doubled, and expenditures for instruction increased from $144,553 to $350,520.[361] The size of the faculty body had also expanded, from 56 in 1954 (which included eight exchange faculty) to 71 in 1965, of which thirty percent held the doctoral degree.[362] Faculty had also succeeded in revising the college's statement of purpose which they had previously described as ethical idealism and ineffectual. The new statement, adopted in 1969, reduced the emphasis on the student's character and focused more on competencies that would inform instructional programming and curriculum planning and evaluation. The new statement specifically highlighted the sciences, noting that students would demonstrate "an understanding and

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[359] In 1965, 87.9 percent of students enrolled at the college were from southern states. It would not be until the 1970s that Spelman began to attract students from outside the South and be able to define itself as a national institution. Albert Manley, 1995, p. 74.

[360] Spelman College *Self-Study Report*, 1968, p. 5

[361] Ibid, p. 3 .

[362] Albert Manley, 1995, p. 2

appreciation of the importance of science and scientific discoveries and use of the scientific method of inquiry as a possible approach to problem solving and decision making."[363]

The Process of Convergence and A Plan of Growth

While the students of Spelman took part in efforts to gain civil rights for the disenfranchised in Atlanta and to push for a voice in the governance of the college, a small group of faculty were also pushing for change. In the late 1960s, the science faculty at Spelman began questioning the low production of science majors and graduates. They were convinced that students simply were not seriously encouraged to pursue the sciences. They pointed to the dark, uninviting nature of the science building, Tapley Hall; the lack of emphasis on science and health careers, and little recognition of scientists and their contributions to society. [364] Even with the changes to the Spelman College curriculum that had begun to surface as a result of the consciousness-raising of the 1960s, the role of women in science and engineering was not discussed in classes or presented in publications.[365]

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[363] Spelman College *Self-Study Report*, 1978, p. 4

[364] Oral interview interview conducted with Etta Z. Falconer and Albert N. Thompson, Atlanta, Georgia, April 30, 1999.

[365] Etta Z. Falconer, "A Story of Success: The Sciences at Spelman College," *SAGE: A Scholarly Journal on Black Women*, vol. VI, no. 2, Fall 1989, p. 36

Only students majoring in biology and mathematics could take their major courses at Spelman; and even in these fields, the enrollments were small and the breadth and intensity of course offerings was minimal. In biology, the concentration was limited to zoology and botany and was seemingly designed to prepare students for allied health and domestic careers.[366] Mathematics, on the other hand, offered tracks dependent on whether the student was planning to attend graduate school, teach, or work in industry. The only chemistry courses, two eight-hour sequences in "General Chemistry" and "Organic Chemistry," were service courses for majors in home economics and physical education.[367] If a student wanted to major in chemistry, she had to take her course work at neighboring Morehouse College, a liberal arts institution exclusively for men. While physics was not offered as a major, Spelman did offer a course, "General Physics." But, again, the course was not offered at Spelman but through special arrangement with the physics department at neighboring Clark College.[368] The dynamics that existed in having

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[366] See, for example, Catalog of Spelman College, 1954-1955, which lists courses such as Practical Biology, Household Microbiology, Comparative Anatomy, Genetics and Histology.

[367] Falconer's assertion at this point is contradictory to information contained in college bulletins for the time period. The bulletin covering 1966-68, for examples, lists General Chemistry 101 and 102 and Organic Chemistry 239 and 240. And it would seem that these courses were, in fact, being offered as the same bulletin lists two faculty in chemistry, Xenonphon Neal and James Siberts. A third faculty in chemistry would be added the following year, Sister Ruth, though she would only be listed as a visiting faculty member. The bulletin does note, however, that all other chemistry courses were offered at Clark and Morehouse colleges. See *Spelman College Bulletin*, 1966-68, vol. 37.

[368] Spelman College *Self-Study Report, 1968,* p. 119

one or two females in a classroom filled with men -- on the campus of an institution established for men -- caused concern among Spelman students and faculty. If nothing else, it certainly was not in keeping with the philosophy of single-sex education, the reason why parents sent their daughters to Spelman College.

Confusion of what was being offered, what information was published in the official college bulletin, and how faculty were advising students was a source of major concern as the institution prepared for re-affirmation of its accreditation. In Spelman's self-study report to SACS in 1968, the college notes that while Spelman offered two 8-hour courses in chemistry to satisfy a minor in chemistry, this information was not reflected in the bulletin.[369] The report also expressed concern about why Spelman students pursuing the major in chemistry were not required to satisfy the same requirements as students at Morehouse, even though Spelman chemistry majors took the majority of their course work at Morehouse.

The low number of majors in several departments also raised concern about whether those departments should continue to exist. In the same Self-Study Report, the curriculum committee raised the option of merging Spelman's mathematics department with the department at Morehouse and questioned whether Home Economics should

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[369] Ibid, p. 131

continue to exist.[370] The question of whether to continue to offer the two chemistry courses, and subsequently, offer chemistry as a minor, sparked a more substantive discussion. Chemistry was more costly than mathematics, given the requirement of offering a laboratory component and purchasing equipment and materials for experimentation. With an average enrollment of 68 students in the General and Organic chemistry courses that the college offered (biology and home economics majors were also required to take these courses), it was clear that the college didn't have the numbers to justify the continuing expense. In addition to low numbers, there was also concern over the number of part-time instructors that were teaching chemistry and the lack of oversight over the quality of course content.[371] Each of these factors caused concerned, and faculty were convinced that these were the reasons why only 28 out of 167 seniors (16 percent) were science majors as compared to 81 seniors (48 percent) in the social science disciplines of psychology, political science, sociology and history.[372]

Table 5.1 illustrates the enrollment trends, which would dip significantly in the mid-1960s before experiencing a small increase by the end of the decade (for reasons that will be explained later in this chapter). For the period 1964 through 1968, the average number of seniors who were biology majors stood at 12; in chemistry, the average was

[370] Home Economics would eventually be disbanded in 1975.

[371] Spelman College *Self-Study Report*, 1968, p. 137

[372] Spelman College *Report of the President 1968*, p. 36

less than 1. In home economics, the average was 8.6; and in mathematics, the average number of seniors hovered at 5.8. In comparing the number of biology majors to the most popular major at Spelman, psychology, the number is exceedingly low, with the average number of students pursuing majors in psychology standing at 26 over the five-year period.

Table 5.1
Spelman College
Comparative Sample, Seniors by Selected Majors and Years
as Percentage of Total Senior Class, 1964-1968

MAJOR	YEAR AND TOTAL NUMBER OF SENIORS				
	1963-64 (T=96)	**1964-65 (T=101)**	**1965-66 (T=114)**	**1966-67 (T=112)**	**1967-68 (T=167)**
Biology	15 (15.6%)	14 (13.8%)	9 (7.8%)	11 (9.8%)	12 (7%)
Chemistry	–	–	1 (>1%)	–	--
English	8 (8%)	13 (13%)	13 (11%)	6 (5%)	21 (12.5%)
History	2 (7%)	1 (5%)	2 (7%)	1 (8%)	5 (3%)
Home Economics	10 (10.4%)	15 (14.8%)	5 (4%)	6 (5%)	7 (4%)
Mathematics	6 (6%)	4 (3.9%)	2 (1.7%)	8 (7%)	9 (5%)
Psychology	24 (25%)	15 (14.8%)	29 (25%)	25 (22%)	38 (22.7%)

Source: *Spelman College Self-Study Report to Southern Association of Colleges and Schools: 1968*. Spelman College Archives, Atlanta, GA, p. 134

While institutional data confirms low numbers in the sciences, the perception by faculty that Spelman wasn't doing enough to produce Black women scientists is inconsistent with what we now know was the college's early history, the intentions and motivations of its founders within the milieu of the post-Reconstruction South, and the reality of not having the finances of the better-resourced northeastern women's colleges with which Spelman often compared itself.

The perception that Spelman wasn't doing enough to attract more women to the sciences also seems to discount efforts that had been undertaken prior to that time, albeit limited and individually located among faculty in specific departments. One individual who seems to have been instrumental was Helen Tucker Albro, a white faculty member who was recruited to Spelman in 1931, rose to the position of chair of biology, and retired in 1960 after 29 years of service. Born in Rhode Island and having earned the doctoral degree from Brown University, Albro is among those early women in science who, though interested in research, spent her career teaching. At a convocation honoring Albro's service to Spelman, former student Birdie Lucille Scott Rolfe described Albro as an educator who had contributed to the "intellectual emancipation" of the sciences, referring to "outmoded customs which placed limitations on the expectancy of accomplishments because of some non-essential accidents like sex."[373] Rolfe contended that Albro had contributed to the development of "many nurses, many masters of science,

[373] Birdie L. Scott Rolfe, "A Salute," *Spelman Messenger,* Atlanta, GA: May 1960, pp. 25-29.

many doctors of philosophy and medicine who got their primary inspiration in her [Albro's] laboratories and classrooms."[374]

Another of those students taught by Helen Albro was Barnett Smith who, as an undergraduate at neighboring Morehouse College, took classes at Spelman and would later earn the doctoral degree from the University of Wisconsin before taking over as chairperson of biology after Albro retired. Falconer (1989) credits Smith, who had actually been a member of the Spelman faculty since 1945, with securing the first electron microscope in the Atlanta University Center.[375] Albert Manley's annual report to the Board of Trustees in 1957 highlights Smith's research on *trichimonas vaginalis*, which had been supported by a grant from the National Institutes of Health (NIH).[376]

Falconer also makes mention of William [sic] Caruthers, who had joined the faculty in 1960, for producing strong students in microbiology; William LeFlore, also in biology since 1963, for creating opportunities for students to conduct research in the field of parasitology; and Georgia Caldwell Smith, the fourth known Black woman in the United States to earn the Ph.D. in mathematics and chair of the department until her death in

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[374] Ibid.

[375] Etta Z. Falconer, "A Story of Success: The Sciences at Spelman College," in *SAGE*, vol. VI, No. 2, (Fall 1989), p. 36

[376] Spelman College, Report of the President, April, 1957.p. 10

1961, with serving as a role model.[377] Gladys Thomas Glass, who joined the Spelman faculty in 1959, was another person within the mathematics department. Falconer credits each of these faculty, all of whom except Caruthers had earned the doctoral degree, with planting the "early seeds for success."[378]

It was due to the presence (as role models) and efforts (through mentoring) by some of these early faculty members that students were attracted to Spelman to pursue science, despite what faculty viewed as low institutional priority. Pamela Gunter-Smith was one of those early students who found her way to Spelman in 1969, earned the B.S. in biology in 1973, and in 1978, become the first African American female to earn the doctoral degree in physiology from Emory University (in Atlanta), where her research focused on cell membrane transport processes.[379] Gunter-Smith had attended all-white high schools and her mother, who had taught at Fisk and Tennessee State universities (both HBCUs), felt it was important that her daughter attend an HBCU. "My choices,"

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[377] A review of several Spelman College bulletins indicates that Etta Falconer may have made an error, as there was no William Caruthers on the Spelman faculty, but rather a John Q. Caruthers in the biology department. It should also be noted that Georgia Caldwell Smith would defend her dissertation orally but would die before graduation ceremonies at the University of Pittsburgh. The institution awarded her degree posthumously.

[378] Ibid, p. 36

[379] Harold M. Barnette, "Spelman's Response to the Scientific Challenge," *Spelman Messenger*, vol. 108, no. 1, (Summer/Fall 1993)

explains Gunter-Smith, “were Hampton, Spelman or Howard.”[380]

Gunter-Smith, who attributes her interest in science and research to her childhood experiences of doing embalming work as part of her family’s funeral home business and a mother who encouraged her to be independent, chose Spelman. Recalling an early trip to Atlanta to visit the college, Gunter-Smith says that Barnett Smith (then chair of biology whose research was supported by the NIH) showed her the electron microscope, and “I was sold.”[381] It also didn’t hurt that Spelman was able to offer Gunter-Smith a full tuition scholarship and that her uncle was the president of Atlanta University, an HBCU directly across from Spelman College.

After enrolling at Spelman, Gunter-Smith continued contact with Smith, as well as with other science faculty. She helped William Leflore set up his research lab. Leflore and Smith encouraged her to go to the Woods Hole Marine Biological Lab in Massachusetts during the summer. Gunter-Smith was one of a handful of African Americans there and was also one of only a few undergraduates and females.[382] Gunter-Smith was also in the minority at Spelman College. “When I enrolled at Spelman,” she recalls, “there were 40 students in the introduction to biology class. By the time I graduated, the class size had

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[380] Olivia A. Scriven. Oral interview interview conducted with Pamela Gunter-Smith in Atlanta, Georgia on 4 January 2002

[381] Ibid.

[382] Ibid

dwindled to 20 and eventually 6 students."[383]

What Gunter-Smith lacked in student colleagues, she indicates that the benefit of a supportive environment, including having Shirley McBay for mathematics, Sister Ruth for chemistry and Eleanor Franklin, a visiting professor from the historically Black Howard University who taught Gunter-Smith physiology during her senior year.[384] Spelman's supportive environment was both empowering and disabling. Gunter-Smith insists that Spelman gave her a clear sense of self and self-worth, and that the playing field was equal. What Spelman did not do, in Gunter-Smith's estimation, was prepare her for the competitive environment that she would experience outside the college's gates. Gunter-Smith explains that at Spelman, "there was no preconception of what you could or couldn't do. I was nurtured and protected at Spelman because I didn't have to be conscious of gender and race."[385] At the same time, Gunter-Smith recalls, "There was no sense of competition. A lot of students just got by."[386]

While some students may have gotten by, the steady disappearance that Gunter-Smith witnessed as she progressed in her major did exist. Unfortunately, nothing in Spelman's

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[383] Ibid.

[384] Ibid.

[385] Ibid.

[386] Ibid.

written institutional records up to that period reflects an analysis that would explain the attrition, aside from anecdotal information from faculty. Research undertaken nationally provides insight. According to Project Kaleidoscope, an undergraduate science reform effort established by the Independent Colleges Office and supported by the NSF, nearly 50 percent of first-year college students with interests in natural science and engineering do not survive to a baccalaureate degree, attributable to, amongst other factors, poor articulation between the secondary and post-secondary curricula.[387] The report further points out that 40 percent of senior high schools offer no trigonometry, 70 percent offer no calculus, 10 percent offer no chemistry, and 20 percent no physics.[388] Insufficient academic preparation is particularly acute when analyzed based on race. According to Wilson (2000), the mean number of years in mathematics and science courses for African Americans is 3.3 and 1.5, respectively, while the figures for white high school students in mathematics and science courses stand at 3.6 and 2.8.[389]

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[387] Project Kaleidoscope, *What Works: Building Natural Science Communities*, Washington, DC: Stamats Communications, 1991, p. 77 Another study by the NSF revealed that among students who entered college in fall 1980 immediately after high school and intended to major in a science or engineering field, 16 percent of black and 34 percent of white had completed their bachelor's degrees 4.5 year later. The percent that completed less than 1 year of study was twice as high for blacks as for whites. (See National Science Foundation, *Blacks in Undergraduate Science and Engineering Education*, NSF 92-305, Special Report, Washington, D.C., 1992)

[388] Ibid, p. 77

[389] Reginald Wilson, "Barriers to Minority Success in College Science, Mathematics, and Engineering Programs, in George Campbell, et. al., *Access Denied: Race, Ethnicity and the Scientific Enterprise*, Oxford and New York: Oxford University Press, 2000.

Insufficient academic preparation during the high school years was not the only factor contributing to student attrition. For racial minorities, lack of financial resources was also identified as a major contributing factor. Examining the parental resources and financial aid of full-time freshman at four-year institutions in 1987, the NSF noted that over half of Black freshmen were first-generation college students and almost 40 percent had parents who earned less than $20,000.[390] The report noted that half of the Black freshmen students took out loans to pay for the cost of their first year, and one-fifth had major concerns about how they would pay for their college education.[391] As examined in the previous chapter, Spelman students fit a similar socioeconomic profile given the college's position as a predominately regional college attracting students from Atlanta and other cities and rural areas in Georgia. According to institutional records, during the 1963-1964 academic year, a total of 127 students had National Defense and other loans totaling more than $46,000.[392]

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[390] National Science Foundation, *Blacks in Undergraduate Science and Engineering Education*, NSF 92-305, Special Report, Washington, D.C., 1992)

[391] Ibid.

[392] *Spelman College Report of the President*, April, 1965, Spelman College Archives, Atlanta, GA. National Defense Student Loans were appropriated under the National Defense Education Act (NDEA) of 1958, established in response to Cold War fears of the growth of science and engineering education in the Soviet Union. Title II of the NDEA authorized appropriations to establish student loan funds at colleges and universities.

Gunter-Smith's uniqueness as a science major when she first enrolled at Spelman in 1969 was not lost on science faculty. Two faculty in particular, Shirley McBay and Etta Falconer, both in mathematics, were convinced that the institution was not doing enough to encourage its students to pursue majors in the sciences. As only the ninth and twelfth African American women in the United States to earn doctorates in the field of mathematics,[393] the two had no role models in science during their own academic journey. They wanted to put in a place a structure that would enable this younger generation and future students to have what they didn't – access to other women in science who looked like them and the benefit of an educational environment that nurtured their growth. So, with the eventual support of the institution's president, and aided by an alumna physician, the two women began the process of change.

[393] The chronology of Black women who have earned U.S. doctorates is a fluid list, changing as more information is uncovered and substantiated. Until 2001, Evelyn Boyd Granville, who earned the Ph.D. in 1949 from Yale University, had been considered the first. Granville, however, was replaced by Euphemia Lofton Haynes, who earned the Ph.D. from Catholic University in 1943. Some lists fail to recognize Georgia Caldwell Smith, who passed the oral defense in 1960 for a degree from the University of Pittsburgh, but died before it was conferred (which the university did posthumously in 1961). My chronology includes Smith. Similarly, Scott Williams, professor of mathematics at the State University of Buffalo, lists several other Black women who earned the doctorate in mathematics before McBay and Falconer, including Argelia Velez-Rodriguez, who earned the Ph.D. from the University of Havana in 1960 and became a naturalized U.S. citizen in 1972. I do not list Velez-Rodriguez, as I am concerned with African Americans; nor do I list several others that are cited on the Williams website as I have not been able to substantiate their credentials. As such, McBay and Falconer emerge as the ninth and twelfth based on the number of known and substantiated African American female doctoral degree recipients who earned the Ph.D. in mathematics from U.S. institutions.

Shirley Mathis McBay

Shirley Mathis McBay arrived at Spelman in 1955. At the time, the College had 511 students, most of whom were from the state of Georgia or other states in the South.[394] Born during the Depression, McBay was raised by her mother in the small town of Bainbridge, Georgia. “The school system was segregated. It had eleven years, eleven grades.”[395] McBay counts her mother as her role model who taught her that hard work was necessary to be successful.

McBay’s other role models were her teachers. One in particular, Hattie Mae Mann, was particularly influential. She taught the young McBay math in the fourth grade, showed confidence in McBay’s potential and nurtured her growth. Mann’s support, however, could not shield McBay from the everyday realities of life in the segregated South. McBay would have to take the long way around a park in the center of town if she were to get to the movie theater on the other side of side and was told she couldn’t take advantage of the public swimming pool she would pass as she walked to school.

McBay’s most vivid memories of life in the segregated South were of the body of a Black man tied to the back of Ford model-T car and dumped on the lawn of the court house. The story told by whites in the community was that the Black man tied to the car

[394] Albert Manley, 1995, p. 71

[395] Clarence G. Williams. *Technology and the Dream: Reflections on the Black Experience at MIT, 1941-1999,* Cambridge: Mass.: The MIT Press, 2001, p. 764

and dragged through the streets had raped a white woman. The story told by Blacks in the community was vastly different. Three white men, they said, had attacked the woman; she simply blamed the Black man.[396]

Talented and gifted, McBay graduated from high school at the age of fifteen, attended a private historically Black college, Paine, in Augusta, Georgia, and graduated there at the age of nineteen. At Paine, McBay was forced to major in chemistry because there weren't enough students interested in mathematics to offer advanced courses in the subject. A minimum of five students had to enroll.

Tired of the small town environment, McBay enrolled at Atlanta University after graduation. At AU, McBay rekindled her love of mathematics, earning a master's degree in chemistry in 1957 and a second master's in mathematics the following year. While in graduate school, McBay met her husband, Henry Cecil McBay, an organic chemist more than twenty years her senior, who, as a graduate student in Chicago during World War II, turned down the chance to join the research team that developed the atomic bomb.[397] To help support herself, Shirley McBay began teaching a chemistry laboratory course at Spelman, and later general physics and general chemistry. After a brief period in

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[396] Ibid

[397] Biography Resource Center. "Henry C. McBay," in *Notable Black American Women,* (2002) http://galenet.galegroup.com/servlet/BioRC (Accessed: Feb. 26, 2005)

Chicago and following the death of Georgia Caldwell Smith on May 6, 1961,[398] McBay's husband, Cecil, and the president of Spelman, Albert Manley, decided that McBay should return to Spelman as acting chair of the mathematics department.[399]

McBay would spend the next 15 years at Spelman, even while earning a doctoral degree in mathematics from the University of Georgia and taking care of a family. Recalling the three years she made the nearly seventy-five mile commute between Atlanta (where Spelman was located) and Athens (the small college town where the University of Georgia was located), McBay says that "I would be at [the University of] Georgia during the week and then commute home every weekend. I did all the shopping, all the cooking, all the laundry, everything. I would try to do all that and then go back down there to Athens."[400]

However, the hard work that McBay's mother told her was necessary for success paid off. McBay was the first Black graduate student to enter the university after it had been integrated in January 1961 by Hamilton Holmes and Charlayne Hunter-Gault, almost ten years following the *Brown verus Board of Education* Supreme Court ruling in 1954.

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[398] *Spelman College Bulletin*, 1960-1962 Georgia Caldwell Smith would become only the third Black woman in the United States to earn the doctoral degree in mathematics. Though she defended orally, she would pass away before graduation ceremonies at the University of Pittsburgh.

[399] Williams, 2001

[400] Ibid, p. 769

McBay was also the first African American to earn a doctoral degree – in any field – from the university. McBay's dissertation explored "The Homology Theory of Metabelian Life Algebras."[401] The year was 1966, and all the while, the president of Spelman, Albert Manley, was supporting McBay's growth, acting as employer and mentor.

When McBay returned to Spelman full-time in 1966, she was appointed chair of mathematics. With graduate school out of the way, McBay could devote more of her efforts to the college. Funded by a grant from the U.S. Department of Education, issued under the Title III program of the Higher Education Act of 1965, McBay reorganized the sciences into a divisional structure. She became chair of the division and devoted much of her efforts to writing more proposals and raising funds. By 1973, Albert Manley would add the title of associate academic dean to McBay's vitae. She would hold this dual appointment until leaving Spelman in 1975 to work at the National Science Foundation.[402]

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[401] Wini Warren, 1999, p. 195

[402] Williams, 2001. McBay held several positions at the NSF until 1980, at which point she was recruited to MIT as its first African American dean for student affairs. McBay's tenure at MIT lasted 10 years. In 1990, she resigned to become president of the Quality Education for Minorities (QEM) Network, a national nonprofit organization dedicated to improving the education of African Americans, Alaska Natives, American Indians, Mexican Americans and Puerto Ricans. McBay still holds that position today. See, Massachusetts Institute of Technology. "Paul Gray and the 90s; A Decade of Advancement," in *TechTalk* (October, 1990) and Shirley M. McBay, "Still Underserved after All These Years," in *Issues in Science and Technology,* (Summer 2003)

Etta Zuber Falconer

While McBay was commuting from Atlanta to Athens to complete her doctoral work at the University of Georgia, another Black female mathematician had arrived at Spelman – Etta Zuber Falconer. The 31-year-old mother of three moved to Atlanta because her husband, Dolan, had been offered a job as basketball coach at Morris Brown College, another historically Black institution located near Spelman. According to Falconer's youngest son, Walter, "Mother walked up to the head of the math department at Spelman, told him she needed a job, and he listened to her."[403]

The similarities between Falconer and McBay involved more than their interest in mathematics. Falconer, too, was born in the deep South – Tupelo, Mississippi – during the Depression. Her father had been a physician and her mother a musician who attended Spelman. Similar to Shirley McBay, Etta Falconer also attended college at an early age. In 1953, at the age of nineteen, she graduate *summa cum laude* with the baccalaureate in mathematics from Fisk University, an historically Black institution in Tennessee. At Fisk, Falconer met Lee Lorch, a white faculty member who would become her life-long mentor and who Falconer says "helped to mold me as a person because of his belief in

[403] Walter Zuber Falconer, as quoted in "Etta Falconer, Attracted Black Women to Math," *Atlanta Journal and Constitution.* Sept. 22, 2002. The young Walter Falconer is actually mistaken, as there were no male faculty in mathematics at Spelman at the time. The person to whom Etta Falconer spoke was Albert Manley, president.

the dignity of all people."[404] At Fisk, Falconer also met Evelyn Boyd Granville, only the second black woman in the United States to earn the doctoral degree in mathematics, which she did in 1949 from Yale University. For Falconer, Granville was a career role model.

Lorch encouraged Falconer to pursue graduate study in mathematics. She did so at the University of Wisconsin, earning the master's in 1954. The experience at Wisconsin was unlike any other that Falconer had ever encountered. "Can you imagine what it was like for a 19-year-old black female from Tupelo, Miss. who had been immersed in segregation for all her life to attend the University of Wisconsin. I underwent a major culture shock."[405]

Falconer was invited to remain at Wisconsin and work toward the doctoral degree but refused. The stress of being academically and socially isolated, and in some instances openly ridiculed by white, male students who did not take her seriously as a peer or as a student teaching assistant, was too much for Falconer to bear. She returned to Mississippi where she taught mathematics at Okolona Junior College from 1954 to 1963.

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[404] Etta Z. Falconer, response on the occasion of being presented the 5th Louise Hay Award by the Association of Women in Mathematics, 1995 (www.awm-math.org/hayaward/1995.html). [Accessed 10 July 2006]

[405] Scott W. Williams. "Etta Zuber Falconer,"" *Black Women in Mathematics.* http://www..math.buffalo.edu/mad/PEEPS/falconner_ettaz.html [Accessed: 8 Dec. 2004].

At Okolona Falconer met and married husband Dolan with whom she would eventually have three children. In 1964, the family moved from Mississippi to Illinois after Falconer won an NSF fellowship to attend a teacher training institute and later gained entry to the University of Illinois to begin work on her doctorate. However, after her husband got the offer to coach at Morris Brown College, the family made Atlanta its home.[406]

Falconer joined the faculty of Spelman in 1965, and like Shirley McBay, she juggled family with school to enter the doctoral program at Emory University. Falconer completed the program in 1969, with a dissertation entitled "Quasigroup Identities Invariant under Isotopy." A fellowship from the National Science Foundation in 1971 would take Falconer to Norfolk State College where she published several papers based on her doctoral research in algebra. Falconer, however, had a different goal and thought she could have greater impact on the field by creating pathways of access for future generations of Black women. Falconer returned to Spelman in 1972, first as an associate professor of mathematics and then as department chair when McBay was promoted to dean of the division. Falconer would eventually move into that position as well, when McBay left Spelman to work at the NSF.

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[406] Biography Resource Center. "Etta Zuber Falconer," *Math and Mathematicians: The History of Math Discoveries around the World,* (2002) http://galenet.galegroup.com/servlet/BioRC (Accessed: Feb. 7, 2005)

Audrey Forbes Manley

The third woman in the trio, Audrey Elaine Forbes Manley, came to Spelman via a different path, but her story was similar nonetheless. The road to Spelman College for Audrey Manley was not as a member of the faculty, but as a young student from Tougaloo, Mississippi, who picked cotton and watched her mother suffer from mental illness by the time Audrey was ten.[407] As the oldest of three girls born to Jesse Lee Forbes and Ora Lee Buckhalter, young Audrey knew at the age of 12 that she wanted to become a physician. But unlike McBay and Falconer, who came from communities that supported their dreams, Audrey Manley was told that "poor girls, especially poor Black girls from Mississippi, don't become doctors."[408] Undaunted, young Audrey held onto her dreams, even after she and her two younger sisters, Yvonne and Barbara, were left with their grandparents as their mother and father searched for work in Chicago. By the time Audrey turned 14, her ailing grandmother could no longer care for her and her sisters. The girls joined their parents, now divorced, in Chicago. Young Audrey hated the experience, recounting that she lost at least two years of her education in the process due to inferior instruction.[409]

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[407] Oral interview interview with Dr. Audrey Forbes Manley as shown on Pure (Oxygen) TV, March 2001.

[408] Ibid.

[409] Olivia A. Scriven. Oral interview interview conducted with Audrey Forbes Manley in Atlanta, Georgia on 19 January 2002

Whatever education Audrey believed she may or may not have received in Chicago did not deter her from enrolling in college. At age 17, Audrey graduated as class valedictorian from Wendell Phillips High School in Chicago and enrolled on a full-tuition scholarship at Spelman, unusual for the time since this was years before the National Defense Student Loans became available or before major programs such as Title III of the Higher Education Act of 1965 made institutional aid available to less-advantaged institutions serving low-income students or racial minorities.

While at Spelman, Audrey majored in biology, with a pre-med concentration, and double-minored in chemistry and mathematics. “When I enrolled at Spelman,” she recalls, “I was looking for good science.”[410] Unfortunately, the kind of science courses the young Audrey was looking for were not offered at Spelman, so she scheduled a meeting with the president. “I wanted to talk with President Manley about science since I was pre-med. I wanted to take Henry McBay’s chemistry course at Morehouse.”[411]

Audrey Manley insists that her meeting with the president opened up the door for Spelman women to go to Morehouse for science. This door, however, had been opened well before 1955 and became a formalized arrangement when Spelman, along with Morehouse and Atlanta University signed the Agreement of Affiliation in April, 1929.

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[410] Ibid.

[411] Ibid.

However, young Audrey's situation revealed what faculty already knew – there was a demand and a need for Spelman women to have sciences on the Spelman campus.

After graduating from Spelman with honors in 1955, Audrey attended Meharry Medical College in Nashville, Tenn. on a full-tuition scholarship from the Jesse Smith Noyes Foundation.[412] Four years later, with medical degree in hand, she had fulfilled her childhood dream. In 1963, Audrey returned to Chicago to complete a pediatric residency at Cook County Children's Hospital, becoming the first African American woman and, at age 27, the youngest person to be appointed chief resident.[413] That same year, she traveled with Crossroads Africa as part of a volunteer medical team, operating a 30-bed children's ward in a government hospital in Nigeria. She delivered similar services to drug-addicted children in San Francisco.[414]

After several years of private practice and a marriage that ended in divorce, Manley returned to the public sector.[415] Manley's sense of community and service also extended to her alma mater, Spelman College. She did recruiting within the Atlanta University

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[412] Chicago Daily Tribune, "Doctor is Successful Despite Age, Sex, Race Background," *Chicago Daily Tribune,* (Nov. 9, 1961)

[413] Ibid.

[414] Ibid.

[415] Biography Resource Center. "Audrey Forbes Manley," in *Notable Black American Women,* (2002) http://galenet.galegroup.com/servlet/BioRC (Accessed: 7 Feb. 2005)

Center on behalf of the University of Chicago. She also often returned to the institution to deliver invited speeches to the students. On the occasion of her 10-year reunion, Audrey encouraged students to fulfill their social responsibility in a democratic society, and that meant to become agents of social change.[416] In 1966, Audrey was elected to the Spelman Board of Trustees where she would continue to influence the path and direction of the college. Her influence would also extend more personally than her trustee responsibilities.

In 1970, with a 26-year age difference separating them, Audrey would marry Albert Manley, the man who she had petitioned to take advanced chemistry courses at neighboring Morehouse College under Cecil McBay and the man had conferred her baccalaureate degree fifteen years earlier. But when she returned to the Spelman campus and noticed the number of students declaring pre-med had dropped, she turned to her now husband and asked, "What can we do?"[417]

Albert Manley had been committed to curriculum reform since arriving at Spelman in 1953. One of his last reports to the Board of Trustees re-affirmed that commitment.

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[416] Forbes, Audrey. "Ten-Year Reunion Address" in *Spelman Messenger*, vol. 81, no. 4 (August, 1965)

[417] Olivia A. Scriven. Oral interview conducted with Audrey Forbes Manley in Atlanta, Georgia, 19 January 2002

> The traditional exclusion of women and especially Black women from many fields has reached the beginning of its end. Today's woman and tomorrow's woman will not suffer lightly the indignities, oppression and stock excuses that have excluded her from positions of business and professional leadership. . . .As new doors open to Black women, Spelman must provide training for new positions.[418]

While Shirley McBay, Etta Falconer and Audrey Manley were primarily concerned with curriculum improvements and expansion in biology, chemistry and mathematics, these disciplines were not the primary focus of Albert Manley. He was more broadly concerned with moving Spelman away from the functional rigidity that characterized the curricular offerings under his predecessors and aligning the Spelman academic program within the liberal arts genre. But by Manley's own assessment, the greatest advances and increase in student majors were taking place in the social sciences.[419] When Manley appointed Oran Eagleson dean of instruction in 1954, the Indiana University-trained psychologist increased student enrollment in those disciplines in which he felt most comfortable – the social sciences. Manley supported Eagleson's efforts, noting that "my colleagues valued the future relevance and importance of well-trained women in these

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[418] Spelman College Report of the President, 1971-72, p. 2

[419] Albert Manley, 1995.

[social science] areas.[420]

The institutional focus on social science may not have fully shifted attention away from other areas, but one would have to assume it did have an impact. Table 5.2 reflects a 20 percent decline in the number of biology graduates between the period when Albert Manley took office and the year before his retirement. For that same time period, the number of social science graduates (which Spelman classifies as including the disciplines of Economics, History and Psychology and Child Development) experienced an 800 percent increase! The shift is staggering. In 1954-55, biology majors had accounted for nearly 15 percent of the graduating class. In 1974-75, fewer than four percent of the graduating class majored in biology. Social sciences, which accounted for just under a quarter of the 1954-55 graduating class, produced in excess of 60 percent of Spelman graduates in 1974-75.

[420] Ibid, p. 35

Table 5.2
Spelman College
Percent Distribution of Graduates by Major for Selected Years

Major Area	1954-55 (N=69)	1964-65 (N=94)	1974-75 (N=223)
Biology	14.5	11.7	3.6
Fine/Applied Arts	17.4	6.4	9.0
Home Economics	8.7	16.0	7.2
English	30.4	10.6	11.9
Social Sciences	24.6	37.3	60.8
– Economics	0	0	7.2
– History	5.8	0	2.2
– Psychology & Child Development	1.4	16.0	31.6
Other	4.4	18.0	7.5

Source: Albert E. Manley. *A Legacy Continues.* Lanham, MD: University Press of America, 1995.

The Plan to Reinvent, Strengthen and Expand the Science Program

Manley's 1968 report to the trustees does reflect efforts to expand science offerings and to strengthen biology, chemistry, and mathematics.[421] Shirley McBay would provide leadership for the effort. The mathematician worked with faculty to develop a

[421] Spelman College, *Report of the President*, April, 1968.

comprehensive plan to improve the science program and attract more students. One of the first activities under the plan was the creation of a Division of Natural Sciences. This was accomplished in July, 1972 with grant funds awarded by the U.S. Department of Education under Title III.[422] The college had previously received Title III funding — individually and as a member of the Atlanta University Center consortium – to strengthen the sciences. During the 1967-68 academic year, Title III funds enabled Spelman to hire ten new faculty, adding strength in a number of departments, including mathematics.[423] During the same period, Spelman also collaborated with the AUC institutions, under the leadership of Clark College, to develop and offer a science survey course for non-science majors, focusing on the relationships between disciplines, the power and limits of the scientific method, and the content and significance of the physical and biological sciences.[424]

With its own Title III grant to support the new division, Spelman's departments of biology, chemistry and mathematics were put under one unit with Shirley McBay as

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[422] The Higher Education Act of 1965 (Public Law 89-329, 79 STAT 1219) was passed to strengthen the educational resources of U.S. colleges and universities and to provide financial assistance to students in postsecondary and higher education. Title III of the Act particularly makes provisions for institutional aid for historically Black colleges and universities.

[423] Spelman College, Self-Study Report to SACS, 1968.

[424] Ibid.

chairperson.[425] Falconer recalled thinking that if the institution went to a division structure, it would be more competitive for the millions of dollars in grant funding that was being funneled through the federal government during this period.[426] Yet, what of a division with no students?

Increasing Students: Pre-College and Summer Bridge Programs

In an effort to increase student enrollment, faculty established in 1972 the Pre-Freshman Summer Science Program for students who were interested in majoring in science, as well as engineering and health. The program was not only used to recruit students, but to avert the high rate of attrition which was commonplace during the freshman year. Through their own experience, faculty at Spelman knew that between entrance and the sophomore year, students suffered from the usual college adjustment problems, as well as from ineffective study skills and habits, serious gaps in their science and mathematics foundational backgrounds, financial hardships, and low self-esteem. More recent studies, such as the NSF-funded report by Project Kaleidoscope, would substantiate faculty

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[425] The Natural Science Division would later include the Health Science Program and the Health Careers Program. It would also include students who were part of the Atlanta University Center Computer Science Program and the AUC Dual Degree Program in Engineering. The Natural Science Division served as a precursor to the development of an institution-wide divisional structure at Spelman which included the Fine Arts, Humanities, and Social Sciences.

[426] Olivia A. Scriven. Oral interview conducted with Etta Z. Falconer in Atlanta, Georgia, 30 April 1999. See also Etta Z. Falconer, "A Story of Success: The Sciences At Spelman College, in *SAGE*, vol. VI, No. 2, (Fall 1989)

experiences.[427] The faculty perceived the pre-freshman summer science program as a bridge to help improve the student's chances at success. Albert Manley agreed, noting that while intellect and talent are important, an increase in numbers also requires co-curricular programs that help students to "overcome the psychological fears of science that re-instilled in Black women through unequal educational opportunity and sexual discrimination."[428]

The Pre-Freshman Summer Science program took in sixteen students during its first year of operation in 1972.[429] It would eventually support between 40 and 50 students annually who scored well on the Scholastic Aptitude Test (SAT),[430] had good high school grade point averages, and otherwise demonstrated the potential for academic success.[431] The

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[427] Project Kaleidoscope, 1991

[428] Spelman College Report of the President, 1971-72, p. 3.

[429] Falconer, 1989.

[430] By this time, Spelman was keeping copious institutional records, including the characteristics of students applying to and accepting admission to the college. According to Spelman's Office of Institutional Research, in 1972, the average SAT score for Spelman applicants was 1032, up from 777 just two years prior. However, the average SAT score for students who accepted admission and eventually enrolled at the college was 844, with an average of 420 on the verbal and 422 on the math components. (See Albert Manley, 1995, p. 72) The national average for the same time period was 1039, with 530 on the verbal and 484 on the math. (See College Entrance Examination Board, *2004 College-Bound Seniors* http://www.infoplease.com/ipa/A0883611.html [Accessed 12 April 2006].

[431] Spelman College *Self-Study Report for the Southern Association of Colleges and Schools*, 1978

program was funded with institutional and external grant funds (including support from the Jessie Smith Noyes and Rockefeller foundations and the federal government) and taught by faculty from Spelman and other AU center institutions. The six-week curriculum offered both basic and accelerated instruction in biology, pre-calculus, reading, chemistry and computer sciences, with each student's schedule dependent upon her declared major.[432] Students could earn up to three credit hours in mathematics and four in biology, and could also satisfy the college's reading requirement.[433] Falconer notes that the counseling and enrichment components were particularly important as they helped students to develop a greater awareness of what it really meant to be a scientist.[434] Professionals in the field were invited to campus to give lectures and career talks. These practicing scientists, many of whom were female and Black, did more than simply talk about their jobs. They provided students with critical role models.

New Curricular Offerings: A Dual Degree in Engineering

The Pre-Freshman Summer Science Program provided a model of student development that would be adapted for other science and health programs. One field where there had been barriers to Black women's participation was engineering. As a strategy to reduce this disparity, in 1972 Spelman entered into agreement with the Georgia Institute of

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[432] Ibid.

[433] Ibid.

[434] Etta Z. Falconer, 1989.

Technology (Georgia Tech), located approximately three miles from the Spelman campus, to offer a Dual Degree Program in Engineering. While engineering was among the "unthinkable" careers for Black women, Spelman had moved into the field – despite the glut of engineers that had begun to saturate the market at this time. With a cohort of eleven students, the 3-2 program offered students the option of spending three years at Spelman to complete pre-engineering course work and two years at Georgia Tech to complete major courses in engineering, emerging at the end of the five years with degrees from both institutions.

Evelynn Hammonds was one of the first students to enter the newly established dual degree engineering program.[435] A native of Atlanta, Hammonds was the oldest of two girls born to William Emmett Hammonds, a postal worker, and Evelyn Marie Hammonds, a reading specialist and elementary school teacher.[436] At age nine, Hammond's father, who had studied chemistry and mathematics while a student at historically Black Morris Brown College, presented his daughter with a chemistry set. The chemistry set, along with later gifts of a microscope and building sets, sparked an interest in science that would be encouraged by both parents.[437] The events also set her

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[435] It would be Donna Smith Palms, however, who was the first Spelman student to receive a dual degree in engineering. See Harold M. Barnett, 1993.

[436] Spelman College Office of Alumnae Affairs

[437] Aimee Sands, "Never Meant to Survive, A Black Woman's Journey," *The Racial Economy of Science: Toward a Democratic Future*, Bloomington and
(continued...)

on a path that would force her to think more critically about her own identity and the struggles and contributions of blacks and women in science.

After graduating high school in 1971 as a National Merit Scholar, Hammonds enrolled at Spelman, not her first college choice. Though she eventually participated in the dual degree program, Hammonds' major at Spelman was physics. Since there was no physics department, she took most of her classes at neighboring Morehouse College. Reflecting back on her undergraduate days in the Atlanta University Center, Hammonds says that the experience was important because it enabled her to come "to terms with what it was going to mean to be a female and be a serious scientist."[438] Hammonds began to articulate this perspective after attending a presentation on campus by Shirley Jackson, the first African American woman to earn a doctoral degree from MIT, which she did in 1973 in theoretical particle physics.[439] The Jackson talk prompted a discussion among students about whether women could be female and serious scientists. Ironically, the opposition wasn't coming from faculty or from classmates at the all-male, neighboring Morehouse College. The pressure was coming from female peers who felt Hammonds,

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[437](...continued)
Indianapolis: Indiana University Press, 1993, p. 241

[438] Ibid.

[439] See "Shirley Ann Jackson." *Scientists: Their Lives and Works*, Vols. 1-7. Online Edition. U*X*L, 2004. Reproduced in *Biography Resource Center*. Farmington Hills, Mich.: Thomson Gale. 2006. http://galenet.galegroup.com/servlet/BioRC [Accessed: 12 April 2006]

with her goal of becoming a scientist, wasn't being the "right kind of woman."[440]

The particularistic remarks and attitudes that Hammonds experienced based on her gender would be magnified to include race once she matriculated at Georgia Tech as part of the dual degree program requirements. The sentiment was that the black students were only there because of affirmative action. Hammonds recalls an experience with a male lab partner who questioned her ability to run the experiment but expected that she would simply take notes. In another instance, Hammonds recalls a faculty member who, impressed by Evelynn's penmanship, asked whether she ever considered becoming a secretary! Hammonds was one of three Black women who entered Georgia Tech that year as part of the Dual Degree program, but she would be the only one of the three to finish.[441] The Dual Degree program still exists today and has been expanded to include

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440 Williams, 2001.

441 After completing the dual degree engineering program in 1976, Hammonds entered the Massachusetts Institute of Technology with the intention of pursuing a doctoral degree in physics, but would reluctantly leave after completing requirements for the master's degree. After some years working professionally as a software engineer, Hammonds later entered Harvard University where, in 1993, she would become of the first African American women to earn a doctoral degree in the history of science. In 1992, Hammonds would return to MIT to assume her first tenure-track faculty appointment as assistant professor in the history of science. She also held visiting appointments at the Max Planck Institute for the History of Science in Germany, and the University of California at Los Angeles, and was named a fellow in the School of Social Science at the Institute for Advanced Study in Princeton. In 2002, Harvard would offer and Hammonds would accept a joint appointment as professor of the history of science and of Afro-American studies (later renamed African and African-American studies). Hammonds would become only the fourth African American woman tenured within the faculty of arts and sciences at Harvard, the oldest and largest department at the

(continued...)

partnerships with engineering programs at 11 additional universities, including Dartmouth College, Rensselaer Polytechnic Institute, Columbia University, and the Rochester Institute of Technology, amongst others.[442]

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[441](...continued)
institution. Not long after her appointment, Harvard would erupt into one of the most public debates the university had ever seen regarding controversial remarks the university's president, Lawrence Summers, made about innate biological differences that account for low productivity among women in the sciences. Faculty were also concerned with the declining number of female faculty winning tenure during Summers' tenure. Hammonds was named to head a task force to address the issue and later appointed senior vice provost for faculty development and diversity. For biographical sketches on Hammonds, see Aimee Sands, "Never Meant to Survive, A Black Woman's Journey," *The Racial Economy of Science: Toward a Democratic Future*, Bloomington and Indianapolis: Indiana University Press, 1993; Clarence G. Williams, *Technology and the Dream: Reflections on the Black Experience at MIT, 1941-1999*, Cambridge and London: The MIT Press, 2001; Daniel J. Hemel. "Plan Calls for Task Force to Tackle Women's Issues," *The Harvard* Crimson, (Feb. 4, 2005); Harvard University, "Harvard Portrait: Evelynn Hammonds," *Harvard* Magazine (Jan. – Feb. 2003); and Olivia A. Scriven, "Evelynn M. Hammonds," in Henry Louis Gates, Jr. and Evelyn Higginbotham (eds.) African American National Biography (forthcoming from Oxford University Press)

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[442] The partnering universities in the Spelman College Dual Degree Program in Engineering include: Auburn University, Clarkson University, Columbia University, Dartmouth College, the Georgia Institute of Technology, North Carolina A&T State University, Rensselaer Polytechnic Institute, Rochester Institute of Technology, the University of Alabama at Huntsville, the University of Florida, the University of Michigan, and the University of Missouri-Rolla. See www.spelman.edu/academics/ programs/engineering [Accessed: 04 May 2006]. Interestingly, while the program still remains in existence, according to the college's institutional records, the number of majors in the program has dropped drastically over the last five years. During the 2000-01 academic year, the college recorded 100 students as dual degree majors, constituting six percent of the total student body of 2,127. By 2004-2005, the number of dual degree majors had decreased to 60 students, representing three percent of the student body of 2,186 students – a 60 percent decrease over the five-year period. Spelman College Fact Book, 2004-2005.

Recommitting to Health Careers

Audrey Manley was particularly concerned with the decline in the number of Spelman students pursuing pre-medicine and entering medical school. For Manley, the experience as a student at Spelman gave her the confidence to pursue her dream of becoming a doctor. And after a trip to Russia in 1968 where she saw the number of women doctors, Manley declared that, "if Russian women could become doctors, then so could U.S. women. There should be no barriers."[443]

Manley worked with McBay to establish the Health Careers Program, also in 1972. The program was comprehensive in focus and followed a student-centered formula that had worked with the Pre-Freshman Summer Science Program and would later become the benchmark of the Spelman science education and research training program. "We designed the Spelman Health Careers program to help students compete to get into medical school," recalls Manley.[444] She found that students received very little counseling; consequently, they would pack their senior year with demanding courses, such as physical chemistry and physiology. Manley asserts that "there was a missing piece about what students knew about the system," and just saying "I think John would

[443] Olivia A. Scriven. Oral interview conducted with Audrey Forbes Manley in Atlanta, Georgia on 19 January 2002

[444] Ibid..

make a very good doctor will not get John into medical school."[445]

The program assisted students in preparing for medical and professional school entry examinations; coached them for interview sessions with medical school recruiters; and offered tutorials in core subject areas. In addition to receiving academic re-enforcement, students were also taken on trips to medical and dental schools and hospitals, received counseling, and, similar to efforts in the sciences generally, were exposed to African American women who were practicing in the field.

The next step in the strategic plan was the renovation of the existing science facility, Tapley Hall, named for Spelman's third permanent president and built in 1925. McBay and Falconer were successful in winning a grant from the NSF which enabled them to make small modifications, which included an annex to accommodate a biochemistry concentration and the introduction of a laboratory structure.

Finally, another major change occurred in chemistry course offerings. Recall that even though Spelman offered the opportunity for students to major in chemistry, the only courses offered on the Spelman campus were two service courses for students majoring in home economics or physical education. All other courses had to be taken at neighboring Morehouse College, Clark College or Atlanta University. This was still the

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[445] Ibid.

case during in 1968.[446] By the 1970-1971 academic year, all but two of the required 38-hour course sequences – “Advanced Inorganic” and “Advanced Organic” – were being offered on the Spelman campus.[447] It is not clear from the college’s institutional records whether the faculty engaged in the process of course development – which would have been exhaustive for Shirley McBay as divisional chairperson and the two chemistry faculty, Xenophon Neal and Sister Ruth Synder – or whether they simply changed the way the courses were listed – moving the listings from Morehouse, Clark College and Atlanta University to the Spelman catalogue.

Faculty Development: Support to Secure the Doctoral Degree

Spelman needed to add new faculty and provide professional development opportunities for existing faculty to retool and obtain advanced degrees. There was also a conscious effort to identify and recruit more African American faculty. A review of the Bulletin for 1966-68 shows that out of the 13 faculty in biology, chemistry, and mathematics, a total of six held the doctoral degree in their discipline. Of the six, however, only three (less than twenty-five percent) were regular, full-time faculty members. The remainder were either visiting or exchange faculty.[448] Falconer writes that in addition to strengthening

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[446] *Spelman College Bulletin*, Catalog Number 1966-68.

[447] *Spelman College Bulletin*, 1970-1971, vol. 40, no. 3

[448] During the 1968-69 academic year, the full-time Spelman faculty with the doctoral degree included William LeFlore, biology; Shirley McBay, mathematics; Rosalyn Patterson, biology, and Barnett Smith, biology. The two visiting faculty (continued...)

the science program, faculty were also open to returning to school for additional training and securing advanced degrees.[449] The administration at Spelman seems to have been supportive, as Albert Manley in his 1972 report to the Board of Trustees noted that, "Our greatest need at this time is for improvement in faculty salaries and benefits, a sabbatical program and other programs of internal development."[450]

Manley's words seem to have been more than rhetoric. That same year, the College received a $200,000 gift from the Andrew W. Mellon Foundation to support faculty development.[451] The Mellon grant helped to further support faculty development efforts that started in the mid-1960s. McBay and Falconer had both returned to school to get their doctorates – McBay in 1963 and Falconer in 1966. The additional funds enabled more faculty to pursue the doctorate. Gladys Glass, a faculty in mathematics since 1959, pursued a doctorate in science education from Georgia State University in 1975.[452]

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[448](...continued)
included Sister Ruth Snyder, chemistry; and Kenneth Wegner, mathematics. There were three additional faculty who were on exchange and taught courses at Spelman but held appointments in other schools of the Atlanta University Center. These faculty included LaFayette Frederick, in biology at Atlanta University; Roy Hunter, Jr. in biology at Atlanta University; and Om P. Puri, in physics at Clark College. (See *Spelman College Bulletin*, 1968-1969, vol. 38, no. 1)

[449] Falconer, 1989, p. 37

[450] As quoted in Spelman College *Annual Report*, 1971-1972, p. 3

[451] Ibid, p. 7

[452] *Spelman College Bulletin*, 1976-1977

Others followed. Table 5.3 reflects both an increase in the number of faculty as well as an increase in the number of faculty with doctoral degrees, from 50 faculty in 1955 to almost 100 in 1975, fifty-six percent of whom held the doctorate.[453] And as we shall see in the later years under the presidential administrations of Donald Stewart (in the mid-1970s through the mid-1980s), faculty development would continue to be a priority and the percentage of faculty with the doctorate would rise to a height of eighty-three percent.

Table 5.3
Spelman College
Selected Faculty Characteristics, 1955-75

Year	Total No. Of Faculty	Student/Faculty Ratio	Percent of Faculty with Doctorate
1955	50	13:1	22
1960	55	14:1	25
1965	71	13:1	30
1970	86	14:1	56
1975	99	14;1	56

Source: Albert E. Manley, *A Legacy Continues*, Lanham, MD: University Press of America, 1975.

The growth in faculty notwithstanding, the McBay-Falconer-Manley trio were more concerned with facilitating an increase in students. There was success here as well. During the 1973-74 academic year, shortly after the trio began their plan of growth,

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453 Albert Manley, 1975, p. 82

Table 5.4
Spelman College, Percentage of Majors by Department, 1973-74 through 1975-76

Field	1973-74 (N=1077)	1974-75 (N=1155)	1975-76 (N=1238)
Biology	10%	11%	14%
Chemistry	1%	2%	2%
Computer Science*	1%	1%	2%
Dual Degree Engineering	2%	4%	6%
Home Economics	5%	3%	4%
Mathematics	4%	4%	3%
Physics*	--	--	.2%
Total	23%	25%	31.2%

* Majors offered through cooperative agreements with other colleges in the AU Center.
Source: *Spelman College Self-Study Report for the Southern Association of Colleges and Schools, 1978*, Spelman College Archives, Atlanta, GA.

science majors (including Home Economics) constituted 23 percent of the 1,077 students enrolled and 14 percent of the 223 graduates.[454] By the close of the 1975-1976 academic year, science majors (including Home Economics) constituted 37 percent of the 1,238 students enrolled and 16 percent of graduates.[455]

[454] *Spelman College Self Study Report*, 1978

[455] Ibid.

Table 5.5
Spelman College, Percentage of Graduates by Major, 1973-74 through 1975-76

Field	1973-74 (N=223)	1974-75 (N=224)	1975-76 (N=202)
Biology	5%	4%	5%
Chemistry	--	1%	1%
Computer Science*	--	1%	1%
Dual Degree Engineering	1%	1%	1%
Home Economics	6%	6%	4%
Mathematics	2%	3%	3%
Physics*	--	--	1 %

* Majors offered through cooperative agreements with other colleges in the AU Center.
Source: *Spelman College Self-Study Report for the Southern Association of Colleges and Schools, 1978,* Spelman College Archives, Atlanta, GA.

Chapter Conclusion

The heightened civil rights activism and feminist mobilization of the 1960s and 1970s focused greater public attention on inequities in U.S. society based on race and gender. In the area of science, the promise of greater economic and social benefit that had been the rhetoric of the previous two decades was disrupted by images of science out of control. Public perceptions and criticisms about the use – and abuse – of science were compounded by concerns about *who* got to participate in the scientific enterprise and the *nature* of that participation.

The number of women earning doctoral degrees in science was steadily increasing, but feminists charged that sustained patterns of discrimination rendered them invisible in the profession. Using the strategies of civil rights activists, feminists and other women in science mobilized to raise awareness and effect change. The problem, however, is that attention was focused on the experiences of white women. African American women scientists, whose numbers at all levels of the spectrum were already negligible, found little that spoke specifically to their needs or their experiences of isolation and differentness.

While the Jay study reflected Spelman as one of the major conduits of African American women in the sciences, faculty at this economically and politically marginalized women's college in the South charged that the institution was not doing enough to increase the number of students pursuing science majors. The physical facilities, built in 1925, were inadequate, and those students with any interests outside of home economics, medicine or other health-related fields had to petition to take the majority of their courses at the all-male Morehouse College or the co-educational Atlanta University. Consequently, in 1968, only 28 out of 167 seniors were science majors as compared to 81 seniors in the social science disciplines of psychology, political science, sociology and history – areas where there was a deliberate institutional focus. Similarly, as had been the case since the college's founding in 1881, the majority of Spelman graduates went into one of the few careers open to African American women -- teaching – despite national rhetoric which said that women were now free to pursue male-denominated professions.

Unlike Spelman, the older women's colleges in the northeast, such as Bryn Mawr in Pennsylvania, emphasized the importance of the natural sciences, excelled in them, and consciously worked to create a climate and culture that was conducive to educating women in science. While Spelman students protested for curriculum reform that recognized who they were as African descendent women, science faculty activism focused on an expansion of the science education and research training program that could attract, retain and graduate larger numbers of Black females. Two faculty in particular, Shirley McBay and Etta Falconer, both in mathematics, launched a plan that focused on the student, faculty, and curriculum development and facility improvements.

Albert Manley, the college's first African American and first male president, would be confronted with this newfound sensibility. Manley was not, by any measure, radical in his educational approach or administrative philosophy. But the newfound sensibilities, exposed by the activism of students, in some respects, fit with his own efforts to re-shape and expand Spelman's rigid and dated curricula offerings in something more resembling the intellectual exploration and experimentation associated with the philosophies underpinning liberal learning. McBay and Falconer sought to build at Spelman what they didn't have in their own academic journeys. They found an ally in Albert Manley and later in his second wife, Audrey Manley, a Spelman alumna and 1955 science graduate. When Audrey Manley returned to the Spelman campus in 1970 as first lady, she was deeply disturbed by the decrease in the number of students pursuing pre-medicine. The McBay-Falconer-Manley trio proved to be politically savvy, securing the endorsement of the institution's president and the involvement of other science faculty, thereby diminishing (if not altogether removing) internal obstacles that may have impeded their plans to advance the sciences at Spelman.

Changes to the higher education landscape, effected as a result of civil rights activism and feminist mobilization of the 1960s and 1970s,put Spelman in the right place, at the right time, to begin to build and expand its science program. Led by Shirley McBay as chairperson of the newly-established Division of Natural Sciences, faculty adopted a student-centered approach that included curricular and co-curricular programming, mentoring, linkage with a neighboring engineering school, and exposure to Black women professionals in the field.

Shirley McBay, who would eventually become associate dean, left Spelman in 1975 to become a program director at the NSF and later dean for student affairs at MIT.[456] Albert Manley retired in 1976. He and wife Audrey moved to Washington, D.C. where the Spelman alumna would begin a career with the Public Health Service of the U.S.

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[456] In 1990, McBay would establish her own nonprofit organization, Quality Education for Minorities (QEM) Network, a platform that has enabled her to continue her work with other historically Black and minority-serving. See Clarence G. Williams, *Technology and the Dream: Reflections on the Black Experience at MIT, 1941-1999,* Cambridge and London: MIT Press, 2001, p. 764

Department of Health and Human Services, initially directing sickle cell anemia and other genetic disease programs, and eventually moving up the ranks to become the first woman to direct the National Health Service Corps and the first women to become Deputy Assistant Secretary of Health.[457]

Writing in his last commencement address to the college, Manley reflected that as the first male president, "I, too, had to affirm, with honest conviction that the powers of women are mighty – physically, intellectually and spiritually."[458] As Spelman closed the books on Albert Manley's 22-year tenure, the institution barely resembled that small, regional college of decades past. Spelman had grown from 511 students in 1955 to 1,238 in 1975. The student body, which had been overwhelmingly southern, began to develop a national profile, with students enrolled from every region in the U.S. and a select number of countries internationally. The number of faculty had also increased by nearly fifty percent.

While initial efforts to re-invent, strengthen and expand the sciences at Spelman

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[457] In 1997, Dr. Manley would come out of retirement to accept an appointment as president of Spelman College, a position she would hold until 2002. Oral interview conducted by Olivia A. Scriven with Dr. Audrey Forbes Manley in Atlanta, Georgia on 19 January 2002. Also, biography of Dr. Audrey Forbes Manley, http://www.thehistorymakers.com/biography/biography.asp?bioindex=164 [Accessed 09 July 2006].

[458] As cited in Beverly Guy-Sheftall and Jo Moore Stewart, *Spelman: A Centennial Celebration*, Atlanta, GA: Spelman College, 1981, p. 88

historically will always be situated in the Manley years, science was not his focus. More broadly, curriculum development within a liberal arts genre was central to the Manley years, and with that came the need to increase the number of faculty and their academic credentials. Expansion of the sciences was a secondary agenda, which would evidence an explosion as Albert Manley prepared for his retirement from Spelman.

Nevertheless, the sciences did experience an undeniable shift. Yet, as the experiences of students such as dual degree engineering student Evelynn Hammonds and biology major Pamela Gunter-Smith would reveal, the college still had much work to do to create the climate and challenging curriculum that would nurture and develop highly-qualified African American female scientists. Some felt the quality of what they were taught, and how they were taught to learn, may not have been up to par. As disquieting as that perception might be, it does not discount that something important was happening at this small college in the South; something was planted that enabled these young women to persevere later in the process. What Spelman did in those early years was to give these women a chance to develop their interests and their talents. The challenge of advancing the science program to the next levels would fall to Etta Falconer, who remained to continue the work that she, Shirley McBay and Audrey Forbes Manley had begun.

CHAPTER 6

THE 1980s AND 1990s:

EFFORTS REALIZED . . A LEGACY CONFIRMED

> No one ever told me that women aren't scientists, or could not grow up to be scientists. . .I was nurtured and protected at Spelman because I didn't have to be conscious of gender and race. That is an empowering situation.
>
> Pamela J. Gunter-Smith, Porter Professor of Physiology, Spelman alumna, C'73

A Science Pipeline

By the 1980s, the Cold War rhetoric of national defense and security was tied to a newfound urgency to sustain the country's global competitiveness.[459] Japan was now the major cause of concern, along with a resurgent Europe and challenges presented by

[459] In the January, 1983 State of the Union address, then President Ronald Reagan held out the promise of science and technology as a solution to major problems of national security and economic progress. In his "star wars" speech in March of that year, Reagan called for research to explore an effective defense system against ballistic missile attack. See Bruce L.R. Smith. *American Science Policy Since World War II.* Washington, D.C.: The Brookings Institution, 1990.

rapidly industrializing economies in other parts of Asia and Latin America[460] With a sagging U.S. economy, and a sharply declining manufacturing sector, investment in science and technology was viewed as critical to spur growth.[461]

In its 1983 report, *A Nation at Risk*, the Commission on Education described the need for educational reform at both the pre-college and undergraduate levels in order to address public perceptions that the educational system was failing.[462] Labor forecasters chimed in, predicting shortages in science, mathematics and engineering doctorate holders that would begin in the late 1990s and last until the year 2020.[463] Richard C. Atkinson, former president of the AAAS, warned, "the fact that the number of young people selecting science and engineering careers has not increased during a generation in which [science and technology] pervades every aspect of our lives is nothing less than a scandal."[464]

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[460] Bruce L.R. Smith, 1990.

[461] Ibid. See also Stephen S. Cohen and John Zysman. *Manufacturing Matters : the Myth of the Post-Industrial Economy*, New York : Basic Books, c1987.

[462] United States Department of Education, National Commission on Excellence in Education, *A Nation At Risk: The Imperative for Educational Reform: A Report to the Nation and the Secretary of Education*, Washington, D.C. : The Commission : [Supt. of Docs., U.S. G.P.O. distributor], 1983.

[463] National Science Foundation. *Future Scarcities of Scientists and Engineers: Problems and Solutions*, Summer, 1990.

[464] Quoted in Project Kaleidoscope, 1991, p. 58

Meanwhile, presidential advisors cautioned Ronald Reagan against repeating the educational strategies of previous decades. With the country in a recession, the federal government did not have the financial resources to pump into university education, research and training programs that had characterized federal policy and spending patterns in the post-WWII period. There was a need for data to support more targeted efforts. In response, Reagan's supply-side economics focused on the notion of a "pipeline" to monitor and increase the supply of the science and technology workforce.[465]

Alan Fechter, a policy analyst at the NSF who later became Director of the Office of Scientific and Engineering Personnel at the National Research Council, echoed the need for a new model that would enable the government to make policy based on "what we want to see 10 and 15 years from now in terms of what is coming out of the *pipeline* with respect to science and engineering."[466] Betty Vetter, Executive Director of the Scientific

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[465] Juan Lucena. *Defending the Nation: Policymaking in U.S. Science and Engineering Education from Sputnik to the War Against Terrorism.* Lanham, MD: University Press of America, 2005a. While Lucena argues that the pipeline can be traced to the 1980s, intellectual remnants of its origins can be traced to Zuckerman and Cole's (1975) notion of successive filtering. The two argued that at each stage of education, the percentage of women, as well as minorities, steadily decreases so that their participation is below parity. See Harriet Zuckerman and Jonathan Cole, "Women in American Science," *Minerva.* 13 (1988): 82-102.

[466] As cited in Juan Lucena, 2005. Later, Fechter would warn that "flow data, while necessary, do not provide sufficient information for formulating policy." He further added that "One also needs to know what motivates the flow. This requires an understanding of behavior." Alan Fechter, "Policy Issues," in George Campbell, Jr., et.

(continued...)

Manpower Commission (now the Commission on Professionals in Science and Technology), again picked up the language of the pipeline and focused on populations that had been under-utilized; namely women and racial minorities.[467]

Similar to the rationale undergirding the National Defense Education Act of 1958, the Education for Economic Security Act of 1984 again made the connection between science, technology, education and national security. Juan Lucena (2005) notes that, "instead of acknowledging women and minorities for their contributions to solve domestic problems as it happened in the 1970's, experts began to recognize the potential numerical contributions of both women and minorities to manpower for competitiveness."[468]

The "numerical competitiveness" that the federal government seems to have only recently discovered had existed all along. Gains that African Americans and women had made with the passage of the Higher Education Act of 1965 and Title IX of the Educational Amendment Acts of 1972 to achieve educational equity and parity had finally begun to show results. Table 6.1 reflects African American degree attainment in

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[466](...continued)
al. *Access Denied: Race, Ethnicity, and the Scientific Enterprise*, Oxford and New York: Oxford University Press, 2000, p. 45

[467] Ibid.

[468] Juan Lucena, 2005, p. 39

the sciences for selected years in the late 1970s through the late 1980s. When examined as a whole, the percentage of science (including social science) and engineering degrees awarded to African Americans and to whites for the period is fairly even, averaging about 32 percent.

Table 6.1
S&E Bachelor's Degrees Awarded to African Americans and Whites as Percent of Total Degrees Awarded, 1977-89, Selected Years

Field	1977	1979	1981	1985	1987	1989
Black, non-Hispanic						
Total Science & Engineering	33.1	31.1	31.0	31.4	33.2	32.4
Natural Sciences	7.6	7.8	8.1	10.7	12.1	10.9
Engineering	2.4	2.9	4.0	5.5	6.2	5.5
Health Fields	5.3	5.6	5.9	5.4	5.6	5.6
White, non-Hispanic						
Total Science & Engineering	35.9	35.5	34.9	36.3	35.4	33.7
Natural Sciences	13.2	12.8	12.5	13.6	12.6	10.6
Engineering	5.2	6.6	7.5	9.2	8.8	7.8
Health Fields	6.4	6.0	6.0	4.4	4.3	4.7

Source: National Science Foundation, *Blacks in Undergraduate Science and Engineering*, NSF 92-305, Special Report, Washington, DC, 1992.
Notes: Natural science refers to the physical sciences (chemistry and physics), mathematics, computer science, biological sciences, and agriculture. Total science includes the social sciences and psychology.

However, African Americans would begin to exhibit *equal* rates of baccalaureate degree attainment in the natural sciences in the late 1980s – 12.1 percent for African Americans as compared to 12.6 percent for whites in 1987. According to NSF data, the rate of increase is primarily attributable to the number of African Americans gaining degrees in computer science in the late 1980s (from 0.6 percent in 1977 to a high of 5.1 percent in 1987), as well as a drop in the number of whites pursuing degrees in the agricultural sciences (from a high of 2.7 percent in 1979 to 1.5 percent in 1989).[469] And as had been the case for decades, historically Black institutions would award degrees disproportionate to their number in the higher education community. As reflected in Table 6.2, in 1989, a total of 80 HBCUs accounted for 41 percent of natural science baccalaureate degrees awarded to African Americans.

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[469] National Science Foundation, *Blacks in Undergraduate Science and Engineering Education*, NSF 92-305, Special Report (Washington, D.C., 1992).

Table 6.2
S&E Bachelor's Degrees Awarded to African Americans by HBCUs as Percent of Total S&E Degrees Awarded to African Americans, 1989

Field	Number of Institutions		Number of Degrees Awarded		
	Total	HBCUs	Total	HBCUs	Percent
Total Science & Engineering	1,184	80	17,174	5,478	31.8
Natural Sciences	1,000	72	6,662	2,552	41.0
Physical Science	427	59	823	317	45.0
Mathematics	420	58	834	381	48.0
Computer Science	465	54	2,820	1,048	43.0
Biological Science	676	72	1,890	693	36
Agricultural Science	95	17	295	113	37
Engineering	303	15	2,315	864	27

Source: National Science Foundation, *Blacks in Undergraduate Science and Engineering*, NSF 92-305, Special Report, Washington, DC, 1992.
Note: The physical sciences includes chemistry and physics. Total science includes the social sciences and psychology.

African American women, who had always seemed to be an afterthought in the struggle for educational equity and parity, also began to experience advances. By 1989, the differences in baccalaureate degree attainment between Black and white women attending college for all science and engineering fields had almost disappeared. The two groups experienced the same upward spikes in the mid-1980s and a downward decline by the beginning of the 1990s. However, whereas white female baccalaureate degree attainment in health would begin to drop by the mid-1980s, the same would not hold true for Black women. It would seem that the dream of becoming a physician, coupled with its promise of economic security and reward, still held high stature in the African American community. Additionally, as would be reflected with African Americans generally, a lower percentage of Black women pursued degrees in the agricultural sciences during this time period but began to aggressively pursue degrees in computer science, from 0.4 percent in 1977 to a high of 4.6 percent in 1987.[470]

[470] NSF, 1992

Table 6.3
Percent Distribution of S&E Bachelor's Degrees Awarded to African American and White Women, 1977-89, Selected Years

Field	1977	1979	1981	1985	1987	1989
Black, non-Hispanic						
Total Science & Engineering	27.6	26.5	26.4	26.6	28.6	28.2
Natural Sciences	5.9	6.4	6.7	9.4	11.0	9.6
Engineering	0.3	0.6	1.2	2.1	2.7	2.5
Health Fields	8.1	8.3	8.7	8.0	8.2	8.2
White, non-Hispanic						
Total Science & Engineering	25.9	25.6	25.3	25.9	25.3	24.6
Natural Sciences	8.7	8.7	8.9	10.1	9.2	7.6
Engineering	0.5	1.2	1.6	2.4	2.3	1.9
Health Fields	11.1	11.9	11.8	8.8	8.8	7.7

Source: National Science Foundation, *Blacks in Undergraduate Science and Engineering*, NSF 92-305, Special Report, Washington, DC, 1992.
Note: Natural science refers to the physical sciences (chemistry and physics), mathematics, computer science, biological sciences, and agriculture. Total science includes the social sciences and psychology.

Continuing Growth:

The 1980s, Donald Stewart, and a Focus on Excellence

With the McBay-Falconer-Manley plan for the sciences in full implementation, Spelman was experiencing steady increases in enrollment and patterns of degree attainment comparable to national trends. During the 1975-1976 academic year, science majors (including Home Economics) constituted 31.2 percent of the 1,238 students enrolled and 16 percent of graduates.[471] The graduating class of 1976 would be the last group of students upon which Albert Manley would confer the baccalaureate degree. After 23 years of service, he announced his retirement, and he and wife Audrey made plans to relocate to Washington, D.C. where she would begin a career with the Public Health Service.

Following the announcement of Manley's retirement, the Spelman College campus was abuzz with speculations about who would be the next president. With 1,285 students enrolled during the 1976-1977 academic year (up by 56 percent just ten years prior), Spelman was already the largest it had ever been. [472] The faculty body numbered 96, with 57 percent holding the doctoral or terminal degree.[473] The endowment was valued at $11.3 million, and annual educational expenditures had risen to $5.1 million.[474] Consistent with these dramatic changes and the changing national landscape that sought to redress for under-represented and under-utilized populations (at least under the one term of President Jimmy Carter), most assumed the next leader of Spelman College would finally be an African American woman. These expectations would not be

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[471] Ibid.

[472] *Spelman College Self-Study Report*, 1978

[473] Ibid.

[474] *Spelman College Fifth-Year Report to the Southern Association of the Colleges and Schools, 1984*, p. 50

realized. On June 15, 1976, Francis Day Rogers, Chair of the Board of Trustees, announced the appointment of Donald Mitchell Stewart as the sixth president of the institution.[475]

The announcement of Stewart's appointment was met with extreme resistance by students, faculty and alumnae. There was something inconsistent about a college whose mission was to develop Black women leaders, yet, in 96 years of existence, had not seen fit to appoint a Black woman to the top leadership post. The turmoil over the appointment of Stewart resulted in a 20-hour lock-in of the Trustees at their April meeting.[476] Several hundred students and a few faculty and staff members took part in the protest. The Board took the opposition under advisement, but would not reverse its decision.

Donald Stewart may not have been the candidate most were expecting, but for the next ten years, he would be the one with whom the campus and alumnae community would need to work in order to continue institutional growth. As former associate dean at the University of Pennsylvania, Stewart had no background or experience working with historically Black or women's colleges. However, there was nothing in his public rhetoric that indicated he was not committed to this special sector of institutions. In

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[475] Beverly Guy-Sheftall and Jo Moore Stewart, *Spelman: A Centennial Celebration 1881-1981*, private publication: Spelman College, 1981.

[476] Ibid.

Stewart's opening convocation speech in September, 1976, he affirmed his commitment to women's colleges, especially Spelman.[477] In a later report to the Board of Trustees, Stewart outlined a vision for Spelman that focused on excellence and change while taking special care to articulate the important role HBCUs and women's institutions play in a diversified American system of higher education.[478]

With an expanded and growing science program, Spelman had already begun to make its mark and increase its relevancy. As reflected in Table 6.4, total science, mathematics and engineering majors had risen to an average of 29 percent by the 1976-1977 academic year.

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[477] Ibid.

[478] Ibid, p. 92

Table 6.4
Spelman College, Percentage of Majors by Department, 1975-76 through 1977-78

Field	1975-76 (N=1238)	1976-77 (N=1285)	1977-78 (N=1276)
Biology	14%	15%	16%
Chemistry	2%	2%	2%
Computer Science*	2%	2%	3%
Dual Degree Engineering	6%	5%	5%
Home Economics	4%	1%	.3%
Mathematics	3%	4%	3%
Natural Sciences	--	--	.2%
Physics*	.2%	--	.08%
Total	31.2%	29%	29.5%

* Majors offered through cooperative agreements with other colleges in the AU Center.
Source: *Spelman College Self-Study Report for the Southern Association of Colleges and Schools, 1978*, Spelman College Archives, Atlanta, GA

The college's accomplishments become even more dramatic when compared with national trends. Using the year 1977 as a comparison, of the total number of baccalaureate degrees earned by African American women, 5.9 percent were in engineering and the natural science disciplines of chemistry, physics, mathematics, computer science, and biology (see Table 6.3 in this chapter). Table 6.5 shows that during the same year at Spelman College, the rate was 17 percent (excluding Home

Economics).[479]

Table 6.5
Spelman College, Percentage of Graduates by Major, 1973-74 through 1977-78

Field	1975-76 (N=202)	1976-77 (N=216)	1977-78 (N=253)
Biology	5%	9%	9%
Chemistry	1%	1%	1%
Computer Science*	1%	1%	1%
Dual Degree Engineering	1%	1%	1%
Home Economics	4%	3%	2%
Mathematics	3%	5%	7%
Natural Sciences	--	--	1%
Physics*	1 %	--	.4
Total	16%	20%	22.4%

* Majors offered through cooperative agreements with other colleges in the AU Center.
Source: *Spelman College Self-Study Report for the Southern Association of Colleges and Schools, 1978*, Spelman College Archives, Atlanta, GA.

Further Curriculum Expansion and Enhancement:

Environmental Science, Computer Science and a Physics Program

With Shirley McBay gone to pursue a career with the NSF, and Audrey Manley now

479 *Spelman College Self-Study Report*, 1978

creating policy and implementing programs at the Public Health Service, Etta Falconer would work with her faculty colleagues under the Stewart administration to continue the plan of growth for the sciences. In the summer of 1976, faculty developed new courses as part of the Natural Sciences interdisciplinary sequence. The courses included “Environmental Health,” “Health Services Administration,” a “Nutrition/Biochemistry Seminar, “and Methods of Nutrition/Biochemical Analysis.”[480] The pre-college summer science program, launched in 1972 with 16 students, had expanded to include 47 students, over an eight-week period, several of whom achieved advanced placement in mathematics and biology.[481]

Home Economics was dropped from the curriculum (though students who were already in the pipeline would graduate with degrees in this area). The 1975-76 bulletin would be the last time that Home Economics would be reflected as a major. The following year, Spelman would establish a full-fledged department of chemistry, offer the major in biochemistry (accomplished with funding from the Rockefeller Foundation), and develop a concentration in environmental science.[482] A nutrition laboratory was completed in Tapley Hall, enabling faculty to train students in nutrition research. The nutrition laboratory complemented a variety of other research projects in which faculty involved

[480] Spelman College Report to the Trustees, Nov. 17, 1976.

[481] Ibid.

[482] Falconer, 1989, p. 37

students. These included “Electron Spin Resonance Study of ph-Sensitive Spin Labels;” the “Effect of Pesticides and Herbicides on Purified Enzyme Systems,” and others.[483]

One area of particular growth was computer science. During the 1970s, in response to workforce projections, the member schools of the Atlanta University Center began offering two service courses and a sequence of courses leading to a major and minor in computer science and information.[484] The nation was experiencing an explosion in the field. Even in the sagging heavy manufacturing sector, companies began to introduce computers in manufacturing processes in an effort to increase productivity and efficiency and institute statistical process controls.[485] Small companies also believed they could improve quality by adopting computer-aided design.[486]

Consistent with these employment trends, African Americans were encouraged and aggressively began to pursue degrees in computer science. Nationally, degrees in this field jumped from 0.4 percent of baccalaureates granted to African Americans in 1977 to 4.6 percent in 1987.[487] As reflected in Table 6.4, Spelman experienced similar student

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[483] Spelman College *Report to the Trustees*, 1976, p. 14

[484] *Spelman College Bulletin*, 1970-1971.

[485] Bruce L.R. Smith, 1990, p. 121

[486] Ibid.

[487] NSF, 1992

interest. Demand soon outpaced the availability of the joint Atlanta University Center course offerings. Adopting a strategy that had worked in the past, the college moved in 1982 to introduce its own computer science major.[488] The major would be offered in 1984, and a new academic computing center would be constructed a year later.[489]

Benjamin Martin, a graduate of Morehouse College who would later earn the doctoral degree in applied mathematics from Purdue University and complete post-doctoral studies in computer science and electrical engineering at Georgia Tech, was hired to direct the computer and information science program, which was initially housed in the mathematics department.[490] As Martin saw it, "Computer science is either the fastest-changing field or the underlying cause of change in the fastest-changing fields."[491] In 1986, the program won funding from the U.S. Department of Education, the Pew Memorial Trust, and the Digital Equipment Corporation to further develop the major, as well as institute a computer literacy course for non-science majors as part of the college's general curriculum requirements.[492]

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[488] Spelman College Report of the President, in the *Spelman Messenger*, vol. 99, no. 1, 1983

[489] Harold M. Barnette, 1993

[490] Ibid.

[491] As quoted in Harold M. Barnette, "Spelman's Response to the Scientific Challenge," *Spelman Messenger*, v. 108, Summer/Fall 1993. 1993, p. 19

[492] Ibid.

Apparently, Etta Falconer agreed with Martin. She returned to graduate school to get her master's in computer science (which she earned in 1989 from Atlanta University) so that she could provide better leadership in her role as chair of the division.[493] She was not alone in her efforts. Institutional support for faculty development, started under Albert Manley, continued with Donald Stewart as part of his vision of excellence. Faculty were supported to attend professional meetings and workshops, give papers and, like Gladys Glass in mathematics, take leave to study for the doctorate.[494] Between 1973 and 1978, a total of 11 faculty were awarded sabbatical leave, and 21 faculty were awarded study leaves.[495] The college seemed to be doing particularly well in the sciences; 65 percent of the full-time faculty had the doctoral degree.

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[493] Biography Resource Center. "Etta Zuber Falconer," *Math and Mathematicians: The History of Math Discoveries around the World,* (2002) http://galenet.galegroup.com/servlet/BioRC (Accessed: Feb. 7, 2005)

[494] Ibid.

[495] *Spelman College Self-Study Report*, 1978

Table 6.6
Spelman College
Distribution of Advanced Degrees Earned by Faculty,
Division of Natural Sciences, 1977-78

Department	Master's F.T.	Master's P.T.	Doctorates F.T.	Doctorates P.T.	TOTALS F.T.	TOTALS P.T.	TOTALS Total
Biology	3	--	6	--	9	–	9
Chemistry/Nutrition	1	–	3	1	4	1	5
Health Science	1	–	–	–	1	–	1
Mathematics	2	–	4	1	6	1	7

Source: *Spelman College Self-Study Report for the Southern Association of Colleges and Schools, 1978*, Spelman College Archives, Atlanta, GA.

Faculty were also encouraged to engage in research. Gladys Bayse and Cornelia Gillyard, both in chemistry, received a $36,500 grant from the U.S. Bureau of Mines to conduct research on "Detoxification of Arsenic." William LeFlore in biology, who had sustained an active research program for years, won a $168,984 grant under the Minority Biomedical Research Support (MBRS) program of the NIH to conduct research on "Histochemistry and Cytochemistry of Larval Trematodes."[496] The MBRS program was designed to increase the capacity of faculty from minority-serving institutions engage in

[496] Spelman College *Report to the Trustees*, December 1983, Spelman College Archives, Atlanta, GA

biomedical research and to provide early exposure and provide training for students.

The research not only helped faculty to remain current in their field; it also provided research-training experiences for science majors who could receive academic credit.[497] This option was particularly used as a way to get students interested in graduate study. William Leflore and Barnett Smith had three students in their NIH-funded labs, while faculty doing work in microbiology, funded by the Research Corporation, employed four students.[498]

Executive Order 12232: Federal Support to Strengthen HBCUs

Expansion of the sciences was expensive. Spelman had, in fact, begun to tap into a variety of external funding opportunities from both the private and public sectors, especially programs designed by the federal government to strengthen the research and instructional capacities of historically Black institutions. In 1980, President Jimmy Carter signed Executive Order 12232 which established a federal program ". . .to overcome the effects of discriminatory treatment and to strengthen and expand the capacity of historically black colleges and universities to provide quality education."[499]

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[497] *Spelman College Bulletin*, 1970-71.

[498] Spelman College *Self Study Report*, 1975.

[499] See http://www.ed.gov/about/inits/list/whhbcu/edlite-exec-order.html [Accessed 10 March 2004] The order has been re-affirmed in every presidential administration subsequent to Reagan, including Presidents Carter, George H.W. Bush,
(continued...)

The Order carried a similar spirit and intent as Title III of the Higher Education Act of 1965, which authorized grants to colleges and universities to strengthen academic quality, institutional management, and financial stability.[500] Carter, however, would not win re-election to ensure that activities outlined under the order would take effect.

Ronald Reagan did re-authorize the Order in 1981 and expanded it to include a White House Initiative on Historically Black Colleges and Universities. And in keeping with his focus on supply-side economics and "numerical competitiveness" in science and technology, which could be better realized by focusing on previously under-represented populations, Reagan's order set into motion a government-wide effort to strengthen HBCUs.[501] Under the Order, all executive departments and agencies were required to develop an annual plan and document efforts to increase the capacity of HBCUs to participate in Federal programs, including competing for grant and contract support.[502]

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[499](...continued)
Clinton, and George H. Bush,

[500] Higher Education Act, P.L. 89-329, as amended, 20 U.S.C. Section 1001

[501] Ibid.

[502] Ibid. These Executive Orders would be re-affirmed in every presidential administration subsequent to Reagan, including George H.W. Bush, in 1989, who signed Executive Order 12677 and created a Presidential Advisory Board on HBCUS to provide advise on methods, programs and strategies to strengthen HBCUs; Bill Clinton, in 1993, who required that a senior-level executive in each agency have oversight in implementing the Order and the Office of Management and Budget (OMB) be in involved in monitoring implementation; and George W. Bush, in 2002, who transferred the White House Initiative to the Office of the Secretary within the U.S. Department of
(continued...)

Spelman, whose endowment was only valued at $6.7 million in 1972,[503] had to compete for funds from a wide variety of sources, which it did with comparable success. As previously noted, Shirley McBay had helped Spelman win its first institutional aid grant under Title III of the U.S. Department of Education. Title III continued to provide a source of financial support for the sciences, enabling the Division to purchase an electron microscope during the 1983-84 academic year. Meanwhile, science faculty had begun to expand their fund-raising efforts. In addition to the MBRS program of the NIH, which supported faculty such as William LeFlore in biology, faculty pursued other funding programs through the NIH. The Undergraduate Minority Access to Research Careers Training (UMARC) was another NIH program designed to expose students to biomedical and behavioral research. Spelman pursued and won funding under this initiative with other members of the Atlanta University Center. Not to be outdone in competing for minority talent, the National Aeronautics and Space Administration (NASA) launched the Women in Science and Engineering (WISE) Scholars Program. With funding under this program (which the college would win in 1987 and renew to the present), Spelman was able to provide 50 students with full tuition scholarship support, as well as research training during the academic and summer at NASA centers across the country. In 1989, the college even began its own annual Science Day to enable students to gain experience

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[502](...continued)
Education. While the signing of these executive orders has been symbolic, no data has yet been released to assess impact.

[503] Spelman College *Report of the President*, 1971-72

in making poster presentations and sharing their findings with professional scientists and their student colleagues.[504]

Role Models, Mentors and a Growing Base of Science Alumnae

With a critical mass of students now employed or pursuing graduate studies, Spelman could begin to assess the impact of its intervention activities, outside of enrollment and graduation data. A major indicator were the students themselves. Deborah Prothrow-Stith was one of those science alumnae who was able to reflect on her Spelman experience. Prothrow-Stith graduated from Spelman in 1975 with a degree in mathematics. She later earned the M.D. from Harvard Medical School and six honorary doctorates for her work, research, and scholarship on violence.[505] She has authored more than 80 publications on medical and public health issues, including *Deadly Consequences*, where she set the stage for U.S. policy makers to begin to view and define youth violence as a public health problem, not just a criminal justice issue.[506] In 1987, Prothrow-Stith became the first woman and youngest person ever appointed as Commissioner of Public Health for the Commonwealth of Massachusetts. In 1995,

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[504] Falconer, 1989

[505] Harvard School of Public Health, Departmental Profile, http://www.hsph.harvard.edu/faculty/DeborahProthrow-Stith.html [accessed: 3 January 2006].

[506] See Deborah Prothrow-Stith and Michaele Weissman. *Deadly Consequences.* New York, N.Y. : HarperCollins, c1991.

President Clinton appointed Prothrow-Stith to the National Commission on Crime Control and Prevention. Currently, she serves as Professor, Associate Dean, and Director of the Division of Public Health Practice at the Harvard School of Public Health.

When Prothrow-Stith applied to Spelman College, she had no clear career path. She liked math, found that she could do it well and was engaged by it. "But," she explains, "I didn't go to Spelman to major in math. I didn't quite know what I wanted to do. And between Etta Falconer and Shirley McBay, I found role models and became a math major."[507]

Prothrow-Stith came from a family of high achievers, who placed high expectations on their children. Her father worked for the African American-owned Atlanta Life Insurance Company, starting out as a door-to-door salesman and finally moving up to regional manager. Her mother taught elementary school and eventually opened her own daycare. Reflecting on her teenage years, Prothrow-Stith believes that at age 17, immature and unfocused, she needed the nurturing environment that Spelman provided while at the same time challenging her to be self-critical. "You can't learn unless you are

[507] Olivia A. Scriven Oral interview conducted with Deborah Prothrow-Stith in Cambridge, Massachusetts on 15 February 2002

vulnerable to what you don't know," she states.[508] At Spelman, she further explains, "I had no "junk" to deal with except my own inadequacies. So, if I didn't get an 'A', it wasn't because somebody didn't like Black women, or they weren't giving the grade. It was [because] I didn't do the work. . .I could really face up to what I needed to do and what I didn't do well and not feel like I was letting down the race."[509] It seemed that Spelman cared about what she became and guided her toward better life options. She explains that "in a setting without that guidance, I might not have even gone to medical school."[510]

Prothrow-Stith's analysis of her undergraduate preparation differs significantly from that of 1973 biology major Pamela Gunter-Smith and Evelynn Hammonds, a 1976 graduate of the dual degree engineering program. Gunter-Smith agrees that Spelman enabled her to develop a clear sense of self and self-worth but argues that the lack of curricular rigor and competition hurt her when she enrolled in the graduate program in physiology at Emory University. She nearly flunked out her first year and had to retake a course in histology. "I didn't know how to integrate material and conceptualize."[511] In Gunter-Smith's assessment, the "A" at Spelman wasn't an "A" elsewhere and Spelman placed

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[508] Ibid.

[509] Ibid.

[510] Ibid.

[511] Ibid.

more emphasis on factual knowledge rather than the application to other concepts. "It took me a year to learn the difference. But once I did, I was fine. That was my struggle."[512]

Hammonds acknowledges similar "educational gaps," which would surface once she began to matriculate in the graduate physics program at MIT. Hammonds recalls that an advisor reviewed her transcript, noted that she had received her undergraduate degree from an HBCU, and advised her to start out by taking freshman physics. For Hammonds, the advice was insulting – a graduate student enrolled in a freshman physics course. Recounting the experience, Hammonds acknowledges that there may have been gaps in her educational preparation that would have required taking upper-level undergraduate courses in order to shore up her skills. Perhaps the advice would have been more palatable had the person framed his comments differently, not focusing on her matriculation at an HBCU. For Hammonds, the comment and its presentation was simply racist based on *who* was giving the advice and the *manner* in which the advice was given. The advice may have been legitimate, and in retrospect, Hammonds admits that the advice was right. She lacked certain skills to compete in graduate courses at MIT – as did many students who came from smaller colleges, historically Black or

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[512] Ibid.

predominately white.[513]

Prothrow-Stith feels her academic preparation at Spelman was adequate to prepare her to get through Harvard Medical School. She does, however, place more emphasis on the role Spelman played in helping her to develop a sense of self-worth and high esteem than the strength of the curriculum. She admits it was these factors that helped her get through the culture shock and sometimes hostile environment she encountered at Harvard Medical School. She reflects back on an article written by Bernard Davis, a professor at Harvard, who was critical of the university's attempts to increase diversity and was blunt in his assessment that minority students at Harvard were unqualified to be there. At another point in her life, Davis' comments may have compelled Prothrow-Stith to opt out, but she attributes her persistence to two factors – the sense of self-worth that Spelman had developed within her and the other Spelman graduates who had successfully made it through Harvard. As she recalls, "The class ahead of that had three women from Spelman. In the class behind me, there was one woman from Spelman. And, because of the class in front of me and the three in the class two years ahead of me, I knew I could do it. I just knew I could. Rarely did I question whether I could do it.[514]

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[513] Aimee Sands, "Never Meant to Survive, A Black Woman's Journey," in *The Racial Economy of Science: Toward a Democratic Future.* Bloomington and Indianapolis: Indiana University Press, 1993.

[514] Ibid.

Teresa Edwards, a 1976 graduate of the mathematics program at Spelman, did not fare as well in her graduate study pursuits.[515] Edwards learned about Spelman through her work with the United Church of Christ, which allowed her to travel to Atlanta on several occasions. "Spelman was the only school I applied to," she recalls. "It was the only one I wanted to attend. . . In my application materials, I said I wanted to major in home economics. I wanted to become a decorator."[516]

Edwards wasn't in the summer science group, or the "sweet 16" as students described those who were part of the Pre-Freshman Summer Science Program established in 1972. Unlike those students, who enjoyed academic enrichment and co-curricular support, including career exposure, majors in other departments didn't have similar intervention. "I think Spelman has improved in helping students learn about non-traditional areas," comments Edwards, but notes that lack of career exposure limited students' options and was a particular challenge for her as an undergraduate, especially after Spelman stopped offering Home Economics as a major shortly after Edwards enrolled at the college.[517]

Edwards eventually turned her attention to math, where she met a woman she describes

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[515] Olivia A. Scriven. Oral interview conducted with Teresa Edwards in Atlanta, Georgia on 10 January 2002

[516] Ibid.

[517] Ibid.

as her mentor, Etta Falconer. “I remember that Black women taught in the math department,” she recalls. “There were about 15 math majors in my incoming class. By the time I enrolled in Calculus III, there were only about 3 or 4 students. The teaching philosophy was to weed out. It was challenging. The strong survived.”[518]

While Edwards describes the environment in the department as challenging, she also insists it was a supportive place where the class sizes were small and she knew most of the faculty. “They would invite students to their houses. I remember going to Dr. Shah’s house all the time. I felt like I had another family.”[519] Edwards also worked for Mr. Bakker on his research, exploring Eigen values and vectors.[520]

Reflecting on her undergraduate experience at Spelman, Edwards feels it was very important to have female faculty role models. It was an unvoiced importance that was powerful. Edwards recalled that Spelman brought in young faculty like Sylvia Bozeman who connected with the students and had an impact. Once Spelman organized a seminar featuring six of the seven known African American female mathematicians who held the doctoral degree at the time. The event included pioneers such as Vivienne Malone Mays, who earned the doctoral degree from the University of Texas, Austin in 1966, and

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[518] Ibid.

[519] Ibid.

[520] Ibid.

Spelman's own Etta Falconer, who took a leave from the college to earn the doctorate from Emory University in 1969.

In addition to a supportive faculty, Edwards also believes the all-female environment helped to develop confidence. She insists that "girls speak up in all-female environments. All female schools help women become the persons they are going to be, able to talk without taking a back seat to men. Women simply act differently against men."[521]

After graduating from Spelman, Edwards attended Cornell University for a year to study operations research. She insists that this was the only piece of bad advice she got from Spelman. She recalls feeling isolated at Cornell. "I was the only female and the only African American. I had no social life. I ate, slept and studied operations research."[522] Edwards feels as though Cornell took a chance on her. "The mistake they made was accepting me by my damn self."[523]

Edwards transferred to Georgia Tech, mainly because it was in Atlanta, where she earned

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[521] Ibid.

[522] Ibid.

[523] Ibid.

the master's in operation research in 1979. After some years in industry, Edwards returned to Spelman in 1986 as a member of the mathematics faculty. And like Shirley McBay and her role model, Etta Falconer, she returned to graduate school from work. In 1990, she earned the doctorate in industrial and systems engineering from Georgia Tech.[524]

The experiences and observations voiced by Prothrow-Stith and Edwards, as well as those of Gunter-Smith and Manley in Chapter 5, are similar to those expressed in other interviews done nationally. Pearson and Warner (1998) published findings from a random sample of interviews conducted with 44 African Americans who earned the doctoral degree in chemistry, seven of whom were women.[525] The two sought to identify demographic factors that influence African American participation in science. Several characteristics are consistent with factors self-identified by the stories presented here. In the Pearson and Warner study, the majority of respondents developed an interest in mathematics, and later chemistry, early on and graduated in the top quartile of their high

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[524] Ibid. While at Spelman, Edwards employed many of the strategies that made math so enjoyable and engaging. She involved students in her research, assisted by a grant through the David and Lucile Packard Foundation. Edwards eventually left Spelman in 2002 to join the mathematics faculty at Bennett College, the other HBCU for women in Greensboro, North Carolina. In 2005, she left Bennett to work with Shirley McBay to continue her goal of increasing quality educational opportunities for African American and other women of color.

[525] Willie Pearson, Jr. and Isiah M. Warner, "Mentoring Experiences of African American Ph.D. Chemists," *Diversity in Higher Education*, vol. 2, pp. 41-57, 1998

school class, which, by and large, was predominately Black. The respondents were heavily influenced to attend college by their parents and teachers. “In contrast,” Pearson notes, “whites generally cited themselves.”[526] Of the 44 respondents, more than half attended an historically Black college or university, while 40 percent attended a predominately white college or university. Of those who attended HBCUs, mentoring, which may include the opportunity to work with a faculty member on a research project, emerged as a common denominator that influenced respondents to persist in chemistry and pursue the doctoral degree.

Assessing the Program

As a single-sex, predominately Black college, Spelman provided for each of the alumnae profiled here (and, presumably, others) an environment that nurtured interests which had been stimulated through past experiences and parental involvement. With few men in the classroom and surrounded by other Black women, students felt free to, as Prothrow-Stith describes it, “be vulnerable,” to let their guards down and not feel as though they had to represent for their race or for their gender. The other part of that equation, however, is that the real world doesn’t operate this way. The real world of science is value-laden, competitive, and for African American women, often isolating and hostile. Prothrow-Stith and Edwards would learn this when they entered graduate and professional school.

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[526] Pearson and Warner, 1998, p. 47

At the same time that Spelman was achieving success in attracting and graduating students, the institution was not engaged in the kind of critical self-assessment that Prothrow-Stith claims it imposed on its students. Such self-assessment might have proved useful in understanding attrition rates that plagued some departments, like biology, but not others, like mathematics. Was it simply a matter of the course material, the academic preparedness of the students, or the role and involvement of faculty such as Etta Falconer and Nagambal Shah who students repeatedly identified as mentors? One must recall that Spelman was involved in rapid scale-up in curriculum, co-curriculum, and faculty development. In 1972 alone, three new programs were added and the college went from offering two service courses in chemistry to offering all but two of the required 38-hour course sequences. It is difficult to envision how, in the midst of such frenetic activity, coupled with a full teaching load, advising students and keeping up with their own research, faculty would have been time to reflect on what worked and why.

The Stress of Growth

Spelman seemed to have been doing everything that would eventually be prescribed by experts as essential ingredients to build a strong undergraduate science program – small classes, mentoring, role models, career exposure, curriculum modification to include hands-on investigation, faculty development, and student research training. Each of these enhancements were geared toward two objectives: an increase in majors and an increase in graduates. Tables 6.7 and 6.8 show that their efforts continued to be met with success throughout the 1980s, even if administrators didn't engage in an analysis to assess why.

Table 6.7
Spelman College Enrollment by Major Area,
Fall 1983-84 through 1986-88

Major Area	1983-84	1984-85	1985-86	1986-87	1987-88
Education	59	47	48	57	61
Fine Arts	44	33	38	37	48
Humanities & Languages	191	148	223	251	236
Science & Mathematics	*666 (40%)*	*566 (35%)*	*685 (40%)*	*647 (36%)*	*627 (35%)*
Social Sciences	526	394	589	648	697
Unspecified	156	416	104	126	113
Total	1,642	1,604	1,687	1,766	1,782

Source: *Spelman College Fact Book 1992-93*, Spelman College Archives, Atlanta, GA.

In three decades, the College had almost doubled the share of science graduates, from 16 percent in 1958 to 28 percent in 1988. In the midst of all the curricular and faculty development activities, student enrollment was steadily increasing, constituting nearly 30 percent of the student body. Except for computer science and physics,[527] all major course

[527] The computer science major, along with a sequence of course offerings, would be established at Spelman in 1984. The program in physics, to address greater student (continued...)

offerings were now being offered on the Spelman campus, addressing a criticism that had long been leveled by faculty and students.

Table 6.8
Spelman College Graduates by Major Area, 1988 and 1989

Major Area	**1986**	**1987**	**1988**	**1989**
Biochemistry	--	1	1	3
Biology	15	9	8	34
Chemistry	7	11	12	17
Computer Science	32	43	23	21
Dual Degree Engineering	2	8	3	7
Mathematics	20	14	18	10
Natural Sciences	12	17	16	15
Physics	3	--	3	1
All Science Graduates	91 (35%)	103 (34%)	84 (28%)	108 (30%)
All Graduates	253	297	299	353

Sources: *Spelman College Preliminary Fact Book 1991-92* and *Spelman Fact Book, 1992-93*, Spelman College Archives, Atlanta, GA.

All of the growth and expansion, however, placed stress on the infrastructure and on faculty. Even though Spelman boasted a student/faculty ratio of 14:1 for the institution,

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[527](...continued)
demand, would be established in 1991.

the ratio in the sciences was far above that, averaging 29:1 by 1983.[528] This average was consistent throughout all departments in the division, biology, chemistry, and mathematics and computer science.[529]

There was also the question of the faculty teaching loads. As late as 1989, the minimum teaching load requirement for full-time faculty was 12 credit hours per semester (on average, equivalent to four courses), provided the faculty had no administrative responsibilities.[530] This meant that faculty had contact hours with more than 100 students per semester. As an undergraduate institution, Spelman could not offer faculty the relief of graduate student teaching assistants that might exist at a university. Administrators at Spelman acknowledged that while the 12-hour workload was typical of many historically Black colleges, "it was not typical of elite private colleges with which Spelman would ideally like to be compared."[531] Those institutions, such as Mount Holyoke and Wellesley, had a teaching average of two or three courses per semester.[532] Administrators at Spelman also acknowledged that the institution had fewer faculty members than many of those institutions and that Spelman generally hired more part-

[528] *Spelman College Self-Study Report*, 1990.

[529] Ibid.

[530] Ibid.

[531] Ibid., p. 179

[532] Ibid.

time faculty, which was not the case at the private colleges in the northeast and which put Spelman in the position of being unable to adequately control the quality of teaching, advisement and mentoring.[533]

The inadequate size of the faculty body and the high teaching load was certainly not lost on science faculty. They enjoyed what they were achieving with the science program, but were increasingly voicing frustration. Etta Falconer acted as leader, advocate, and a sympathetic ear. Glayse Bayse, a white faculty member who had been recruited to the campus to chair the new chemistry department, describes Falconer as “the glue that kept us together during the bad times -- the times of three in an office, tutoring in the bathrooms, and students lined up sitting on the floor against the walls when they came to see faculty.”[534] The patience of Bayse and other science faculty could be extended only so far. The general consensus was that they (the faculty) had sacrificed for Spelman. It was now time for the institution to make a commitment. As Spelman alumna Audrey Forbes Manley described the situation, “If Spelman had been a co-ed school, we would not have waited 15 years to build a science building. There was never an institutional

[533] Ibid.

[534] Sylvia T. Bozeman. Oral interview conducted with Gladyse Bayse in preparation for the “Infinite Possibilities” conference at Spelman College on 2 April 2005.

commitment to the sciences as a number one priority at Spelman."[535]

The 1990s:

Johnnetta Betsch Cole, The Need for a New Science Facility,

and an $80 Million Capital Campaign

By the time Donald Stewart left office in 1987, Spelman had truly evolved into a national liberal arts college, and the role of the Spelman science program – as a national conduit for the production of African American women with degrees in science, engineering and mathematics – had been firmly established. The student population was growing, as was the depth and breadth of the faculty, the curricular offerings, and the student development and academic enrichment programs. There was, however, a major problem. They were running out of physical space.

The Board of Trustees knew that it could not face another wave of campus protest which characterized the appointment of Donald Stewart as president of the college in 1976. The students had demanded that it was time for a Black woman to lead the College, and surely, there were qualified Black women who were ready to lead – if not from the ranks of Spelman alumnae then from higher education more broadly. Bob Holland, then chair

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[535] Olivia A. Scriven. Oral interview conducted with Audrey Forbes Manley in Atlanta, Georgia on 19 January 2002

of the Spelman Board of Trustees, traveled to New York to meet with Johnnetta Betsch Cole.

Trained as a cultural anthropologist, Johnnetta Cole had developed uncanny people skills. Those who have met and interacted with her all conclude the same thing – she never forgets a name and she makes you feel important. When Cole was recruited to Spelman from her position as a tenured faculty member in anthropology at Hunter College in New York, her administrative experience had been limited to overseeing the Latin American and Caribbean Studies Program at Hunter and a previous appointment as associate provost at the University of Massachusetts, Amherst.[536] Cole, however, was bold in her vision and clear about her commitment to the education of African American women, a commitment that was rooted in feminist theory (to which she subscribed) and years of advocacy to improve the status of Black women.[537] On the occasion of Cole's appointment as president in 1987, she committed to position Spelman as a place where "Black women leaders of the world are nurtured, trained, and developed,"[538] and as the

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[536] Darlene Clark Hine, ed. *Black Women in America: An Historical Encyclopedia*, New York: Carlson Publishing, Inc., 1993.

[537] See, for example, Johnnetta B. Cole and Beverly Guy-Sheftall. *Gender Talk: The Struggle for Women's Equity in African American Communities.* New York: Ballantine Books, 2003.

[538] As quoted in Darlene Clark Hine, 1993, p. 260

college of choice for “the top Black female high school graduates in the country.”[539]

Cole’s areas of expertise were anthropology, African American studies and women’s studies. She was a novice when it came to the natural sciences but vowed to continue to develop the institution’s strength in the area.[540] Cole was able to translate her knowledge of people into something that the institution and the sciences needed – an ability to raise money, a none-too-easy task in the 1980s as the nation still struggled to recover from an energy-driven recession, double-digit unemployment, and Reagan’s second-term policies which resulted in an economic boom for some but continued hardships for the majority of the nation.[541] A hint of Cole’s fund-raising abilities would be revealed at her inauguration ceremony in 1988. Bill Cosby, the famed African American comedian, actor, educator and philanthropist, came through with a $20 million gift – the largest ever

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[539] *Spelman College Report to the Board of Trustees*, Dec. 11, 1987, Spelman College Archives, Atlanta, GA.

[540] Ibid.

[541] James Davidson (1999) notes that by 1982, the recession had pushed unemployment to about 10 percent. Ronald Reagan’s supply-side economics theory argued that high taxes and government regulations stifled business development and economic expansion. The Reagan tax cuts benefitted the upper middles classes and the rich, creating jobs for young, upwardly mobile white males whose earning averaged about $560,000 while the poor labored in part-time, dead-end jobs with an average income of about $20,000. Reagan’s war on inflation pushed jobs overseas and contributed to unemployment, which, even during the recovery period shortly before the end of Reagan’s second term, was about 6 percent. See James West Davidson, et. al. *Nation of Nations: A Concise Narrative of the American Republic*. Boston: McGraw Hill College, 1999.

by an individual to a historically Black institution.[542] Cole's fund-raising skills would be tested further as Spelman launched an $81 million capital campaign, *The Initiatives for the '90s*, the centerpiece of which sought support to build a new science facility.[543]

Plans for A New Science Facility

Built in 1925, Tapley Hall, the main science facility, was originally designed to accommodate separate college and high school laboratories for physics, biology and chemistry, along with lecture rooms, classrooms, and offices.[544] By the late 1980s it became evident that the space was not adequate to accommodate the growing research interests of faculty and students. Faculty in biology and chemistry shared teaching laboratory space, and because research was never envisioned, many faculty maintained labs in a building the college leased off campus.[545] Even with the increase in external grants, faculty could barely afford to acquire new instrumentation and equipment since storage space was limited.[546] The annex to Tapley added in 1974 for biochemistry and another added in 1984 for computer science could not meet the growing needs.

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[542] Julie L. Nicklin, "Spelman Sets Record for Black Colleges by Raising $114-Million," in *The Chronicle of Higher Education*, July 12, 1996. Cosby and wife Camille would later serve as co-chairs for the college's capital campaign, *Initiatives for the '90s.*

[543] Spelman College *Initiatives for the '90s* Case Statement.

[544] Florence Matilda Read, 1961, p. 201.

[545] *Spelman College Self-Study Report, 1990.*

[546] Ibid.

In 1988, the college commissioned a study of its current facilities and options for future growth.[547] When the Wisconsin Team conducted the site visit, they observed what the science faculty already knew – the space in Tapley was inadequate to house the existing programs in biology, chemistry, computer science, and mathematics, and that without significant new space, it would be impossible to accommodate the growing student demand for science courses, the changing nature of science instruction and research."[548] The Board of Trustees endorsed the findings of the Wisconsin Report and voted to construct a new science center, which would include addition of a new wing and renovation of the existing science facility and its two adjacent annexes. The center would house the six basic disciplines -- biology, biochemistry, chemistry, physics, computer science and mathematics -- as well as include space for environmental studies, interdisciplinary natural sciences, and introductory engineering courses.[549]

The Physics Program

As the college began reviewing architectural bids for the new facility, faculty had to move forward with several planned areas of growth. One major priority was the establishment of a physics program. The physics program was particularly important given its relationship to the Dual Degree Program in Engineering. On average, 15

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[547] Ibid.

[548] Ibid

[549] Ibid.

percent of Spelman students enrolled in the Dual Degree Engineering Program selected physics as their major concentration.[550] While this only equated to about 8 students annually, the numbers were fairly consistent with and comparable to national norms.[551] Since establishing the Dual Degree Engineering Program in 1972, Spelman students had to take their pre-engineering sequence at one of the neighboring Atlanta University Center schools after taking their three introductory courses at Spelman. As the Hammonds narrative in Chapter 5 revealed, the experience was problematic, but not unlike conditions for women physicists nationally.

In 1991, the college secured a grant from the AT&T Foundation to establish its own program in physics and recruited Derrick Hylton, who earned the doctoral degree from Yale University, to direct the program.[552] According to Hylton, "Women are still viewed as mentally inferior in the physics field."[553] In Hylton's own entering class at Yale in 1976, he recalls that there was only one woman in a class of 25. A theoretical physicist who collaborates with researchers at the Department of Energy's Lawrence Livermore

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[550] Ibid.

[551] According to the NSF, in 1999, African American women earned only 1.1 percent of doctoral degrees in physics. National Science Foundation, Division of Science Resources Statistics. *Women, Minorities and Persons with Disabilities in Science and Engineering: 2002*, NSF 03-312 (Arlington, VA 2003)

[552] Jo Moore Stewart, "Faculty Focus: The Sciences,"in *Spelman Messenger*, vol. 108, No. 1 (Summer/Fall 1993).

[553] Ibid, p. 21

Laboratory in California in the area of heavy atoms, Hylton hoped to engage students in his research and "change the student's physics image from one of blowing up the world to one of understanding the world."[554]

In an effort to support Hylton's research, the college converted one of its biology labs, but he looked forward to more appropriate space in the new science facility of which faculty were integrally involved in planning. Sylvia Bozeman, professor of mathematics, was appointed to shepherd the process. At this time, faculty had been involved in Project Kaleidoscope, an initiative underwritten by the NSF which specifically focused on strengthening undergraduate science programs as part of the national reform movement in science education. Project Kaleidoscope, or P-Kal as it is known, outlined core components of a successful science program. P-Kal argued that institutions needed to make learning experiential, hands-on and steeped in investigation. The P-Kal project also argued for an environment where faculty see students as partners in the learning process and where students collaborate with each other and with faculty as a means of helping students to build confidence. Finally, P-Kal also advocated that learning be made personally meaningful in order to assist students to make connections to other fields.[555]

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[554] Ibid.

[555] Project Kaleidoscope, 1991, p. vii

Under the leadership of Sylvia Bozeman, with Etta Falconer silently present in the background, the science faculty adapted the P-Kal recommendations to the Spelman environment. Many of the recommendations Spelman had already been instituting for years, such as pre-college bridge programs, student research training, mentoring, faculty-student collaborations between and across disciplines, and student pre-professional development. Now, with the option of appropriate space, the Spelman science faculty focused on designing instructional and research space and made a special effort to pay homage to the College's identity as a historically Black, women's college. They worked with the architects to ensure that the Center would highlight the contributions of African American women, including Spelman alumnae, which was accomplished with the inclusion of a Hall of Science. The new facility also needed to emphasize research and research training as a core part of the curriculum, and provide a natural conduit for interdisciplinary collaboration and interaction.[556]

While faculty worked with the architects to design the building, Johnnetta Cole was on the road raising the needed funds. The total campaign goal was $81 million, with $22.5 million allocated to support the sciences.[557] Donald R. Parfet, executive vice president of

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[556] Spelman College Science Center Master Facility Plan.

[557] Spelman College Messenger, "Ready, Set, Goal: $22.5 Million," vol. 108, no. 1 (Summer/Fall 1993). The $22.5 million goal include a new facility, as well as funds for endowed chairs and student scholarships. The overall campaign goal of $81 million included three components: the endowment at $53 million; a constituency initiative at

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the Upjohn Company, a multinational pharmaceutical firm based in Kalamazoo, Michigan, agreed to serve as the science initiative campaign chair.[558] According to records in the Office of Institutional Advancement, the Robert W. Woodruff Foundation in Atlanta, named for the one-time head of Coca-Cola, contributed an initial $3 million at the start of the campaign and awarded another $3 million as a measure of good faith. The African American talk show host, Oprah Winfrey, who had been a benefactor to neighboring Morehouse College, literally mailed a check for $1 million. Amgen, Inc., a biotechnology start-up in California, contributed $1.5 million. Staff in institutional advancement traveled to Washington, D.C. in order to make a personal appeal to Audrey Forbes Manley, who gave the first alumnae leadership gift of $100,000. By the time the campaign ended in 1996, Spelman closed the books with $114 million – $33 million more than the original $81 million dollar goal and the largest ever raised by an HBCU up to that time.[559] During the decade since Cole's arrival in 1987, the endowment had increased by more than 400 percent, from $50.5 million to $217 million.[560] Most

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[557](...continued)
$5.5 million; and the science initiative at $22.5 million which not only included a new facility, but funds for endowed chairs and student scholarships. (See Spelman College Initiatives for the '90s Case Statement, *The Best Gets Better*)

[558] Ibid. Donald Parfet stepped in as chair following the death of Dr. Theodore Cooper, chief executive officer of the company.

[559] Julie L. Nicklin, "Spelman Sets Record for Black Colleges by Raising $114-Million,"in *The Chronicle of Higher Education*, July 12, 1996.

[560] Spelman College Fact Book, 1998-99 and Spelman College Annual Report, 1997-98.

immediate to the sciences, the college had raised much of the $22.5 million needed to complete the Science Center.[561]

Increased Faculty Research

As Johnnetta Cole raised money through more traditional measures, faculty were doing their share to ensure funds for programming and research. In 1992, the college established an Office of Sponsored Programs, which would exist as part of the Division of Institutional Advancement. The purpose of the office was to assist faculty, across all 17 departments of the campus, to identify and secure funds to support research, curricular, co-curricular and service efforts.[562] The college had addressed the need to increase support for research since the Manley years, and the 1990 Self-Study Report to SACS continued to stress the importance of faculty efforts in this area.[563] By this time, Etta Falconer had developed strong grantsmanship skills, and the College had recruited faculty with similar experiences. A greater effort was needed, however, to increase proposal productivity. After all, as eminent historian of science Kenneth Manning noted,

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[561] The Spelman College Science Center was costed at $22.5 million when the capital campaign was announced in 1993. This figure included construction of a new wing, renovation of the existing facility, and equipment and furnishings. According to the campaign case statement, the figure also included funds for endowed chairs and student scholarships. Rising construction costs in Atlanta increased the final amount, and by the time the facility was completed in 2002, it cost more than $30 million.

[562] Spelman College, Office of Sponsored Programs.

[563] *Spelman College Self-Study Report*, 1990.

“money has always been crucial to a career in science.”[564] Spelman faculty needed to secure grants to remain current in their fields.

The establishment of the Office of Sponsored Programs, coupled with the recruitment of faculty with strong backgrounds in research, proved beneficial. In chemistry, Peter Chen, who joined the faculty in 1992 before completing his doctoral studies at the University of Wisconsin, Madison, became the first Spelman faculty member to win a CAREER award from the NSF. Pamela Gunter-Smith, a 1973 Spelman graduate in biology, returned to her alma mater in 1992 after 11 years working as both teacher and research scientist.[565] This included work as a project manger and research physiologist with the Armed Forces Radiobiology Research Institute at the National Naval Medical Center in Bethesda, Maryland.[566] The college recruited her to Spelman to serve as Porter Professor of Physiology and Chair of Biology. Gunter-Smith’s goal was to continue her research and to engage students in the practice of science.[567] She worked through the Office of

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[564] Manning, *Black Apollo of Science*, 1993, p. 115. In addition to the role external support played for African American scientists such as Ernest Everett Just, another good biographical account which gives insight into the role of external support, and its impact on shaping the contours of research is James Watson and Gunther S. Stent, ed. *The Double Helix: A Personal Account of the Discovery of the Structure of DNA.* New York : Norton, 1980.

[565] Jo Moore Stewart, 1993.

[566] Ibid.

[567] Ibid.

Sponsored Program to win a $800,000 grant from the Howard Hughes Medical Institute to support expansion of the biological sciences.

In mathematics, Sylvia Bozeman, who joined the Spelman faculty in 1974 but took a three-year leave to earn her doctoral degree at Emory University,[568] worked with Falconer and President Cole to secure $1 million from the W.K. Kellogg Foundation to support a multi-disciplinary effort that connected mathematics to other science disciplines in support of faculty and curriculum development and research. Bozeman even launched a student-produced science journal in 1997, *Spelman Science and Mathematics Journal,* which helped to increase student interest in graduate study.[569] Examining data from the 32 mathematics majors in the class of 1993, one-half of whom Bozeman was able to secure reliable information, the mathematician found that 14 out of 16 had earned graduate degrees, including doctoral degrees in probability, operations research and electrical engineering.[570]

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[568] Patricia C. Kenschaft, 2001.

[569] See Spelman College, *Spelman Science and Mathematics Journal: An Interdisciplinary Undergraduate Journal*, Vol. 1, No. 1 (Spring, 1997).

[570] Sylvia T. Bozeman and Colm Mulcahy, "Experiences in Attracting Women to Mathematics at Spelman College," presentation at the Innovative Mathematics Majors in Small/Medium Departments MAA Mathfest Conference, August, 2005. http://persweb.wabash.edu/facstaff/axtellm/Curriculum%20Special%20Session/Mulcahy.html [Accessed: 8 August 2005]

In 1991, Etta Falconer was promoted to Associate Provost for Science Policy and Programs; though, by this time, Johnnetta Cole, with Ruth Simmons (now president of Brown University) as her provost, disbanded the divisional structure. The decision did not interrupt Coles' promise to the sciences, which continued to grow. Student majors in the sciences comprised an average 35 percent of the Spelman student body, which, in 1993, reached a height of 2,028 (see Table 6.9).

Table 6.9
Spelman College Enrollment by Major Area,
Fall 1992-93 through 1996-97

Major Area	**1992-93**	**1993-94**	**1994-95**	**1995-96**	**1996-97**
Education	70	74	64	73	76
Fine Arts	56	52	63	76	79
Humanities & Languages	284	268	233	254	244
Science & Mathematics	*763 (38%)*	*765 (38%)*	*736 (37%)*	*657 (34%)*	*618 (33%)*
Social Sciences	729	734	715	763	731
Unspecified	103	106	134	118	113
Total	2,026	2,028	1,976	1,961	1,899

Source: *Spelman College Fact Book 1996-97*, Spelman College Archives, Atlanta, GA

In 1996, a year before Cole announced her retirement, Etta Falconer would lead the college's efforts to win a five-year, $9.1 million cooperative agreement grant award from the NSF and NASA under the Model Institutions for Excellence Program. As the brainchild and one of the last initiatives of Walter Massey, the Morehouse alumnus who headed the NSF from 1991 to 1993, MIE was designed to build the capacity of minority-serving institutions that had a demonstrated capacity and future potential for educating minorities in science. Spelman was one of only six institutions that received MIE support.[571]

Chapter Conclusion

Faced with growing global competition, the 1980s ushered in a renewed sense of urgency to sustain the nation's preeminence in science and technology. Labor forecasters were predicting shortages in the science and technology workforce, and the Commission on Education called for national reform in science education at the pre-college and undergraduate levels. Recommendations, such as those endorsed by the NSF, focused on student-centered educational models in which learning is experiential, hands-on and steeped in investigation. As had been the case during the Cold War period, women and racial minorities – who had been there all along – were suddenly discovered as potential talent for numerical competitiveness. But unlike strategies of past decades, the Reagan

[571] In addition to Spelman, the other MIE institutions included Xavier University (Louisiana); Bowie State University (Maryland); Oglala Lakota (South Dakota); Universidad Metropolitana (Puerto Rico); and the University of Texas, El Paso (Texas).

administration responded with the notion of a pipeline to monitor the supply and increase growth.

Spelman had already begun to make its mark and increase its relevancy. Student enrollment and graduation rates in the sciences and mathematics exceeded the national average for African American women who had long been an afterthought in the struggle for educational equity and parity and whose numbers were particularly low in science degree attainment. In 1977, the natural sciences accounted for 5.9 percent of the national total of baccalaureate degrees earned by African American women. At Spelman College that same year, the rate was 20 percent.

Donald Stewart, appointed the sixth president of Spelman in 1976 amidst student, faculty and alumnae protest, would work with faculty to continue growth in the sciences. Achievements were particularly pronounced with respect to the curriculum expansion and faculty development. Chemistry was elevated to full departmental status, and new majors were offered in biochemistry and computer science. Faculty were supported to take study leaves and sabbaticals as the college sought to increase the number of faculty with the doctorate or other terminal degrees. By the late 1980s, the number of science majors at Spelman comprised 39 percent of the student body and nearly 30 percent of the annual graduating class.

Such success brought with it another set of circumstances – the need for space. Tapley Hall, the existing science facility, was built in 1925 to support high school instruction in and limited college-level courses in physics, biology and mathematics. Research was never envisioned. Consequently, many science faculty were forced to sustain labs in a leased facility off-site. At Spelman, faculty often shared offices with three to a room, tutored in the bathrooms, or navigated through a maze of students lined up against the wall or sitting on the floor as they waited to be advised. As Spelman alumna Audrey Forbes Manley assessed the situation, "If Spelman had been a co-ed school, we would not have waited 15 years to build a science building." The responsibility of that challenge literally fell on the shoulders of the College's first African American female president, Johnnetta Betsch Cole.

Raising $22.5 million for a science building (the cost of which would eventually rise to $30 million), for an-all female, predominately Black college in the South would prove to be no small challenge, but was met with ultimate success. Cole solicited the assistance of influential individuals in Atlanta and corporate executives to make the case to invest in a program to educate African American women scientists. The numbers were there, as was the quality of Spelman alumnae.

Pamela Gunter-Smith, a 1973 biology graduate who would later become the first African American woman to earn a doctoral degree in physiology from Emory University, managed a research lab at the Armed Forces Radiobioloy Research Institute. Deborah Prothrow-Stith, a 1975 graduate in mathematics who would later earn the medical degree from Harvard, combined her training in medicine and public policy to advise President Clinton and establish models that framed the country's growing incidences of youth violence as a public health issue. Other mathematics graduates obtained doctoral degrees in probability, operations research and electrical engineering.

The frenetic and rapid pace of growth, however, limited the college's ability to engage in a process of critical self-assessment to determine what worked, why or why not. The number of majors and graduates in the sciences was increasing, but attrition was also a problem, in some departments more than others. Was it simply a matter of the course material, the academic preparedness of the students, financial resources, or the role and involvement of faculty as involved and committed mentors? The positive impact of role models and mentors is cited repeatedly by alumnae interviewed for this research as helping them to build self-esteem and confidence that bode well when they entered the competitive world of graduate study – even when they believed that Spelman had not prepared them sufficiently academically.

As Cole raised money through more traditional measures, science faculty were doing their share to ensure funds for programming and research, including the NASA-funded Women in Science and Engineering (WISE) Program, the NIH-funded Minority

Biomedical Research Support (MBRS) program, and in 1991, a grant from the AT&T Foundation to support the establishment of the institution's own physics program. The pinnacle, however, came when the NSF named Spelman a model institution for excellence in undergraduate science and mathematics education, one of only six institutions in the country. For Etta Falconer, who had made the 37-year journey at Spelman her life's work, the college had finally created a place for African American women in science that was recognized nationally.

CHAPTER 7

CONCLUSION

> While the SME [science, mathematics and engineering] fields may seem like esoteric and narrow areas, they are in fact at the root of our industry, the engine of our economy, and the basis of wealth creation. We know that if this knowledge is not available to all segments of the community, we will not have the mechanism for equality or for changing and empowering communities.
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> Shirley M. Malcom, *In Pursuit of Diverse Science, Technology, Engineering and Mathematics Workforce*, 1996

The story of the re-invention, growth and expansion of the science program at Spelman College represents a critical piece in more fully understanding the post-World War II history of U.S. science and the role of the separate Black institution. Once simply normal schools for four million African Americans who could neither read nor write, and then transformed into training grounds for laborers and other blue-collar occupations, HBCUs have battled against structural limitations that left them outside the initial national effort that made the university central to the growth of the U.S. scientific enterprise. This exclusion foretold significant consequences relative to the resources needed to train students in the specialized fields that would be demanded in the emerging society.

African American women, always an afterthought in the push for educational equity and parity, would be doubly marginalized. The curriculum at the few Black women's colleges in the South that managed to remain in existence by the mid-1950s were centered around large vocational and professional departments to train Black female teachers, nurses, and social service workers to aid in the uplift of the race. The thought of Black women as scientists, mathematicians and engineers was outside the frame of reference – and acceptance – of what society thought Black women could or should be. The 25-year effort, begun in the early 1970s at Spelman by two African-American female mathematicians to facilitate a culture that believed Black women could be female and scientists and to create an environment that nurtured their growth – lagged nearly a century behind similar efforts at the older, white women's colleges in the northeast. While those institutions also struggled against the limitations imposed by the notion of a women's sphere, there were major differences. Those differences included the freedom afforded by growing endowments. Such financial resources enabled those institutions to create curricula that provided students the opportunity to excel in the sciences and faculty the opportunity to establish programs that provided an entering wedge for white women in the profession.

The civil rights activism of the 1960s and feminist mobilization of the 1970s disrupted public images about who got to participate in science and the nature of that participation, setting the stage for changes to the federal policy agenda and the higher education landscape. As a Black college and a woman's institution, Spelman was in the right place at the right time to begin to re-invent and expand its science program. Later, the challenge of global competition and a sagging U.S. economy, as well as dire predictions of a shortage of skilled scientists and engineers, introduced in the 1980s the notion of a science pipeline. Initiatives were introduced (again) to reform how undergraduate science was taught and to create strategies for accessing all talent. HBCUs were suddenly factored into efforts to increase the country's numerical competitiveness.

The challenge, however, rests in using the political rhetoric of pipeline as metaphor and methodology. Doing so prevents a full analysis of why such patterns of under-representation and under-utilization exist while giving credence to the faulty assumption that the practice of science operates according to idealistic principles of universalism. U.S. society has never operated that way. Why should one assume that a normative structure is now or ever was applicable given the history of this country and continuing debates of equity, access and equality?

Alan Fechter, Cheryl Leggon, Willie Pearson, Jr., George Campbell, Shirley Malcom, and Kenneth Manning are among a handful of scholars and policy analysts who have acknowledged and attempted to introduce into the historical record and public policy discourse the role and contributions of the historically Black institution. Their contributions are significant and helped to contextualize the experiences of African American scientists, to say more about the politically and economically marginalized Black college, and to connect HBCUs to a larger analysis of the philosophies underpinning the practice of U.S. science.

The small body of literature about HBCUs in the history of U.S. science, however, pales in comparison to treatments that analyze other U.S. institutions that are considered critical to the U.S. scientific enterprise -- MIT, Stanford, Georgia Tech and Johns Hopkins amongst them. Similarly, while social constructivists, feminists and scholars of Women's Studies have helped to expand our understanding of women in science, the research narrowly and almost exclusively concentrates on the experiences of white women. The experiences of African American women, influenced by the double bind of race and gender, still remains largely underexplored in the literature. These issues notwithstanding, the analytical tools employed by feminists, social constructivists and others who questioned the Mertonian model proved useful in showing that science does not operate within a universalistic framework of merit, talent and reward. The practice of science and who gets to participate in the process is influenced by broader political, economic and social factors.

In 1997, Leggon and Pearson called for more systematic studies of scientific education at HBCUs that move beyond simple statistical data.[572] By 2001, the AAAS echoed similar frustrations with a pipeline model and method of analysis. Favoring an ecological approach, the AAAS observed that improved research methodologies must take into account all actors in the system; establish universal standards for data collection that might encourage collaboration and cross-comparison of findings; and expand foci to include factors that not only limit progress but those that facilitate success. Among those factors that had already been proven successful in facilitating progress included pre-college recruitment initiatives, post-secondary academic support programs, financial aid, bridge programs from high school to college to graduate school, mentoring, and institutional environments that nurture student development and acknowledge and value the perspectives that such groups bring to the discipline. These characteristics had long been integrated at Spelman but ignored in favor of majority institutions when experts examined so-called model programs.

[572] See Leggon and Pearson, 1997.

In 1995, however, through a program initiated by an HBCU alumnus and former head of the NSF, that organization and its agency partner, NASA, named Spelman a model institution for excellence in undergraduate science and mathematics education, one of only six such institutions in the country. Spelman's role and legacy in contributing to the human resources needed to sustain the U.S. scientific enterprise, with its particular focus on African American women, had been validated.

By the time of the NSF and NASA announcement, Shirley McBay was already the head of her own Washington, D.C.-based organization to increase quality education for minorities. Audrey Forbes Manley used her medical training and education in public health administration to place in the national spotlight the role of HBCUs in producing physicians and those in the health professions. Twice retired, Manley continues to lecture on the topic today. In May 2002, Etta Falconer retired from Spelman College. Six months later, on September 18, 2002, the former mathematician, educator, college administrator, and mentor to hundreds of black females in sciences would pass away in an Atlanta hospital from complications due to pancreatic cancer. Several years before her death, at a ceremony of the Association for Women in Mathematics, Falconer wrote that:

> I have devoted my entire life to increasing the number of highly qualified African Americans in mathematics and mathematics-related careers. High

> expectations, the building of self-confidence, and the creation of a nurturing environment have been essential components for the success of these students. They have fully justified my beliefs. Perhaps the most rewarding moments have come when younger faculty have undertaken the same goal and have surpassed my efforts, reaching out to the broader community to help minorities and women achieve in mathematics.[573]

Future Research Questions and Policy Considerations

Educators, policy analysts and other experts are currently engaged in wide-spread discourse on the country's global competitiveness within the science and technology sectors and the under-performance of the country's educational system. The tone, tenor and focus of these conversations are not new. Similar debates emerged in the decade immediately following World War II and during the 1980s when Japan and other Asian countries increased their economic strength and technological ingenuity.

The Commission on the Future of Higher Education, a 19-member panel appointed by the U.S. Secretary of Education, is responsible for developing by August, 2006 recommendations for a comprehensive national strategy to meet the nation's need for an

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[573] Etta Z. Falconer, "Response on the Occasion of Being Presented With the 5th Louise Hay Award by the Association for Women in Mathematics," 1995. http://www.awm-math.org/hayaward/1995.html [Accessed: 07 July 2006].

educated and competitive workforce in the 21st century. Under the heading of a "A National Dialogue," one of the foremost topics that the Commission has explored with groups in town hall meetings around the country is ways to improve how we teach science and engage students. The U.S., members of the Commission argue, is falling behind India and China in the number of college graduates in science engineering. There is a need to produce graduates who can succeed in a changing economy, to reach out to minority populations with innovative programs that remove barriers and feelings of alienation and isolation which historically have characterized science education programs.[574]

The political rhetoric of embrace, inclusion and diversity belies what historically has and continues to be the reality of U.S. society and the practice of science in which large segments of the population have been excluded from participating fully based on race and gender. The long battle leading up to the *Grutter versus Bollinger*[575] and the *Gratz versus Bollinger*[576] Supreme Court decisions of 2003 bear witness to the highly charged

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574 See U.S. Department of Education, A National Dialogue: The Secretary of Education's Commission on the Future of Higher Education, http://www.ed.gov/about/bdscomm/list/hiedfuture/index.html [Accessed: 14 April 2006]

575 *Grutter versus Bollinger,* 539 U.S. 306 (2003)

576 *Gratz versus Bollinger*, 539 U.S. 244 (2003). For further discussions on both decisions, see American Association for the Advancement of Science. *Standing Our*

(continued...)

debate over the relevancy of affirmative action versus race-neutral college admissions policies and other political rhetoric that continues to act as a gatekeeper within the U.S. scientific enterprise – from pre-college through the profession. As the AAAS has noted, the under-participation of minorities, women and persons with disabilities in STEM continues as a structural problem, notwithstanding forty years of policy and practice.[577] Nevertheless, as the Reagan administration seems to have discovered in the 1980s, HBCUs have long improvised and implemented strategies that succeed in recruiting, retaining and graduating African Americans in science. What remains unclear, due to lack of sustained research beyond statistical data, is how, why and the extent to which these strategies have worked.

Further Research on the History, Culture and Practice of Educating African American Scientists at HBCUs

If HBCUs are a national resource, as the government asserts, then why not match the rhetoric with resources? Why not appropriate funds, beyond the small-scale effort enacted through the NSF/NASA MIE program and other HBCU capacity-building programs that are now being eroded under the heading "minority serving" to launch a federal agency-wide, comprehensive initiative that would: (1) engage and deploy teams

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[576](...continued)
Ground. Washington, D.C.: AAAS, 2004.

[577] American Association for the Advancement of Science, 2004

of multi-disciplinary scholars whose objective is to develop universal standards of data collection and analysis as suggested by the AAAS that would yield a fuller understanding of why science education at HBCUs has worked (or has not); (2) award funds, through collaborative agreement with the NSF, the NIH, the National Endowment for the Humanities, and the U.S. Department of Education to write the histories of these institutions, provide resources to establish and maintain archives, and interview faculty and other actors who were instrumental in institutional growth but some of whom are reluctant to tell their stories. Gathering such oral histories worked as part of Franklin D. Roosevelt's Depression Era Works Progress Administration, and those documents are rich with information that continue to yield new perspectives about U.S. history; and (3) support Centers of Excellence at HBCUs based on their specific strengths. At Spelman, such a center might be constructed under the theme of women in science, mathematics and engineering while at Hampton University in Virginia, it might be in physics. The objective would be to continue to develop and strengthen the capacities of these institutions to recruit, retain, mentor, support, and graduate dynamic students who have access to state-of-the-art instruction and research training experiences. The Centers would also serve as think thanks, examining issues within a global framework that impact U.S. higher education objectives and offering suggestions that translate theory to practical applications. The Centers would utilize an "each one, teach one" model to create mentor/mentee linkages with other universities as they explore ways to expand their capacities, as well as establish mechanisms to work in partnership with K-12 and community-based, youth-serving organizations.

Further Research on the Influence of

Race, Gender and Socioeconomic Status

I opened this study by indicating that Spelman presents a unique case to analyze the particularistic characteristics of race, gender and institutional setting within the context of a so-called normative structure of science. The Spelman science alumnae who participated in the interviews spoke earnestly and urgently about the importance of being at a Black women's college. Other than Hammonds (who was not interviewed directly), the women were less clear whether Spelman's location in the South was helpful or a hindrance, though several did question the rigor of their academic preparation. When the interviewees were questioned whether the race factor had a greater impact than the gender factor, they could not tease out the two. The need to better understand these factors, or at the minimum, avoid lumping race under gender (which increasingly seems to be the trend) is one that needs to be addressed if, as Jordan has argued, we are to engage in accurate policy and decision-making.[578] A future study might seek to explore and tease out these factors further, undertaking the kind of comparative analysis I would have like to have undertaken given greater time and resources. The study might track a cohort of students from Spelman and Mount Holyoke or Bryn Mawr colleges.

Similarly, my own selection of interviewees is far from being described as a sample. The

[578] Diann Jordan, 2006.

group is too small. It doesn't include any computer science, physics or chemistry majors. Other than the interviewees' description of their families, we can only guess that most were middle-class. Without a true profile, we don't know what impact, if any, socioeconomic status or other factors had on student recruitment and retention.

Spelman College is one of 105 HBCUs scattered across 17 states in the South (including one in the north) and the U.S. Virgin Islands – a community which the federal government describes as a national treasure and resource. The most recent data by the NSF indicates that this small cluster of institutions awarded 29 percent of baccalaureate degrees granted to African Americans in science, engineering, technology and mathematics disciplines for the period 1994-2001.   Considering that HBCUs constitute less than one percent of the nation's more than 4,000 colleges and universities, the rate of HBCU degree production in the sciences is disproportionate to their numbers in the higher education community.

Some of these institutions have been more successful than others, while a disturbing number have simply ceased to exist due to external factors as well as, in the most recent case of Morris Brown College in Atlanta, Georgia, poor management. If there is one universal constant about the Spelman model, it is that the growth of specific programs at these institutions is tied to the tenure of individuals. The individuals who are responsible belong to an aging generation that is fast disappearing. Much of the history is not captured in institutional archives and records, but part of the oral history tradition of African-descended people. Unfortunately, once these individuals pass on, much of that history will pass with them. The task of gathering these stories will not be easy. Jordan speaks of her experiences in conducting interviews and collecting the stories of Black female scientists who were sometimes skeptical, even though she was also a Black woman scientist. It took time to develop the necessary level of confidence to get the women to speak openly, some of whom commented but refused to allow the more sensitive of their observations and viewpoints to be published. Issues of race loyalty and simply protecting one's name and career are always factors.

HBCUs provide a fertile ground to uncover further narratives about educational strategies – what worked and what didn't – to produce many of the African American scientists who currently form the ranks of professionals in the field, as well as those who opted out. Also embedded in these institutional narratives are the individual biographies of African American scientists who earned degrees prior to *Brown versus Board of Education* in 1954, but used their talent to mentor and to create structures that would provide a pathway of growth for future generations. Each of these narratives are mediated by education – a medium that has played a particular role in the Black experience in America, in women's experiences, in regional differences, and in the production of science and technology knowledge bases that continue to create wealth and power that transcend geographic boundaries.

There is a danger, however, in characterizing the Spelman story as something unique and only applicable to African Americans and to women. Good educational practice should be embraced and applied universally. This is not to imply that the nation's colleges and universities should follow prescriptive formulas without adjusting for nuances that are specific to the institution and the student body. That caveat notwithstanding, how might the history of science programs at HBCUs inform current efforts to continue to cultivate talent to fuel the U.S. scientific enterprise, particularly focusing on under-represented racial minorities and women? As those who study the history of science expand the scope of analysis to examine other institutions and actors that are under-explored, will similar strategies and struggles emerge in the histories of Hispanic-serving and Native American (tribal serving) institutions? Is there a similar focus on mentoring, developing a climate of nurturing, and the emphasis on exposing students to role models that characterizes the HBCU model? What is the role of culture in how these institutions engage in the practice of science and developing curricular and co-curricular programs? What have been the contributions of those institutions, and how will an analysis of their stories further inform our understanding of the history of U.S. science?

Finally, the absence of the exploration of African Americans and other people of color in science cannot solely be attributable to scholars who study in the field, even given the small number of Blacks who pursue degrees in the discipline. Deborah Prothrow-Stith, a 1975 graduate of the Spelman College science program, has pointed to the responsibility of faculty at HBCUs to “jack up the scholarship;” to “get on the cutting edge.” The faculty of HBCUs (Black and white), burdened with heavy teaching loads, large classes and poor financial resources, place less emphasis on assessment and publishing. That model has rendered efforts at these HBCUs invisible to the larger higher education community. The model of little to no publishing needs to be replaced by a deliberate effort to document and disseminate and to do so within a framework that doesn’t compromise the need to continue to foster, facilitate and reward student mentoring – one-to-one as well as small group contact.

Efforts to change the model is partly a management issue, and the issue of effective, forward-thinking management is a critical factor that threatens survival and growth at many historically Black universities. Policies, procedures and administrative structures need to be put in place and resources allocated to promote the kind of deliberate assessment that is necessary to inform strategic growth. Efforts to change the model also rest with faculty themselves. If HBCUs have defied the odds and are now setting the standards, then what are we to learn and adapt from these institutions as we prepare future generations of scientists?

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VITA

Born in Harlem, New York, **Olivia A. Scriven** is a doctoral candidate in the School of History, Technology and Society at the Georgia Institute of Technology. Her research, which has been supported by fellowships from the American Association of University Women (AAUW) and Georgia Tech, addresses issues of race, gender and public policy in science and technology studies. She specifically examines the role of historically Black colleges and universities in the growth of U.S. science in the post-World War II period. She is regularly invited to present on her work, most recently at the 26th Annual Women's Studies Conference, "Women, Gender, and Science," in New Paltz, New York in Oct. 2005. Several articles authored by Scriven are set to appear in Henry Louis Gates, Jr. and Evelyn Higginbotham (eds.) African American National Biography (forthcoming from Oxford University Press) and Russell Lawson (ed.) Encyclopedia of American Science (forthcoming from M.E. Sharpe).

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Scriven serves on the Professional Development Committee of the National Council of University Research Administrators (NCURA) and was recently appointed co-editor (2006-2007) of the organization's newsletter. Scriven has authored a grant proposal guide; served on a variety of peer review panels; regularly hosts grantsmanship workshops for educational and non-profit institutions in the United States and internationally; and has served on a variety of panels focused on higher education administration and leadership development. A sampling of workshops include: "Securing Federal Grant Awards: Strategies for the Small Institution," at the 2004 White Initiative on HBCUs International Cluster Technical Assistance Workshop (New Orleans, LA); "Building a Dynamic Research Portfolio," at the 1998 annual meeting of the National Council of University Research Administrators (Washington, D.C.); and "Grants Administration in a Liberal Arts Environment," at the 1997 meeting of the National Sponsored Programs Administrators Alliance of Historically Black Colleges and Universities (Hampton, VA.).

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